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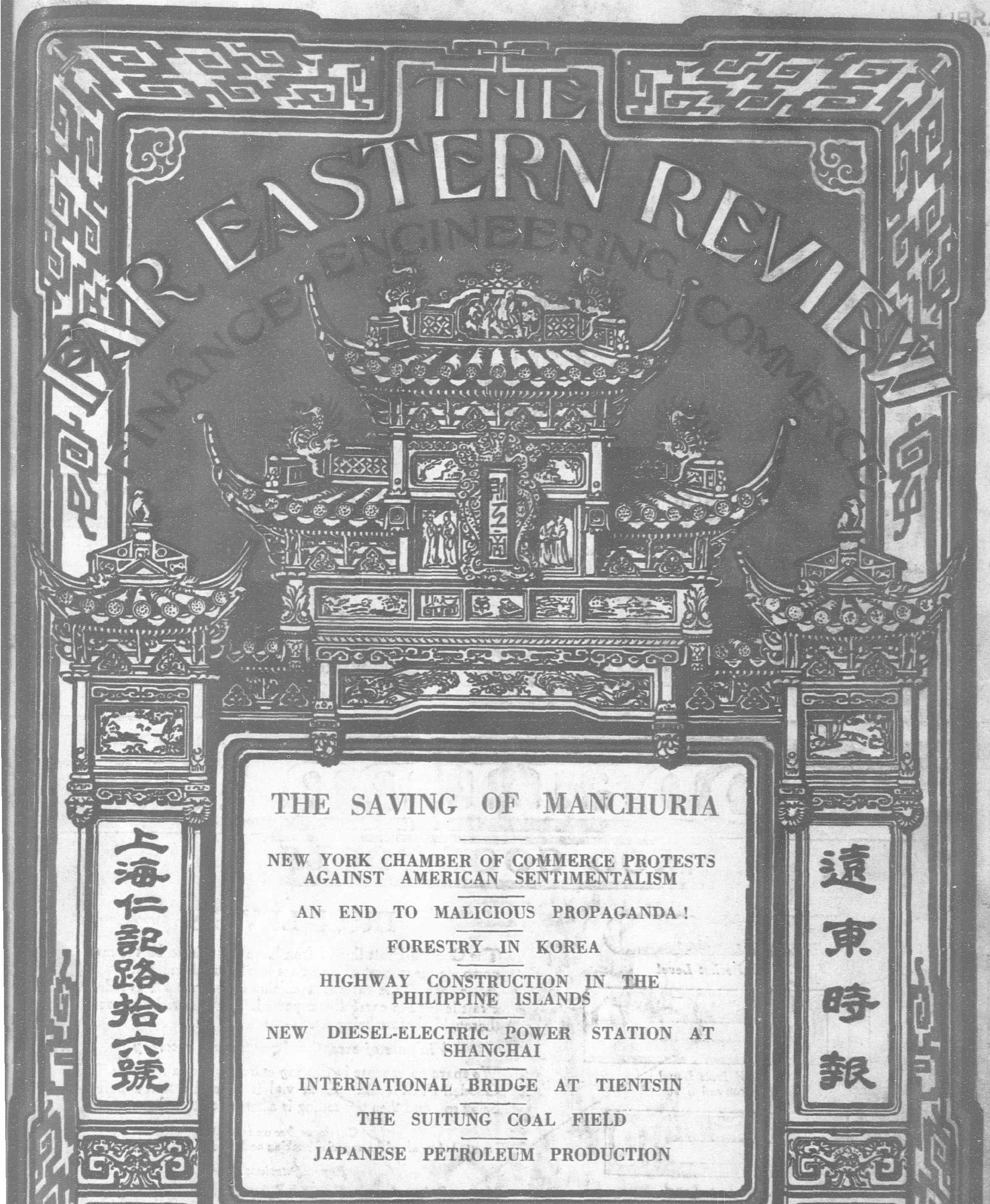

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

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THE SAVING OF MANCHURIA

NEW YORK CHAMBER OF COMMERCE PROTESTS AGAINST AMERICAN SENTIMENTALISM

AN END TO MALICIOUS PROPAGANDA!

FORESTRY IN KOREA

HIGHWAY CONSTRUCTION IN THE PHILIPPINE ISLANDS

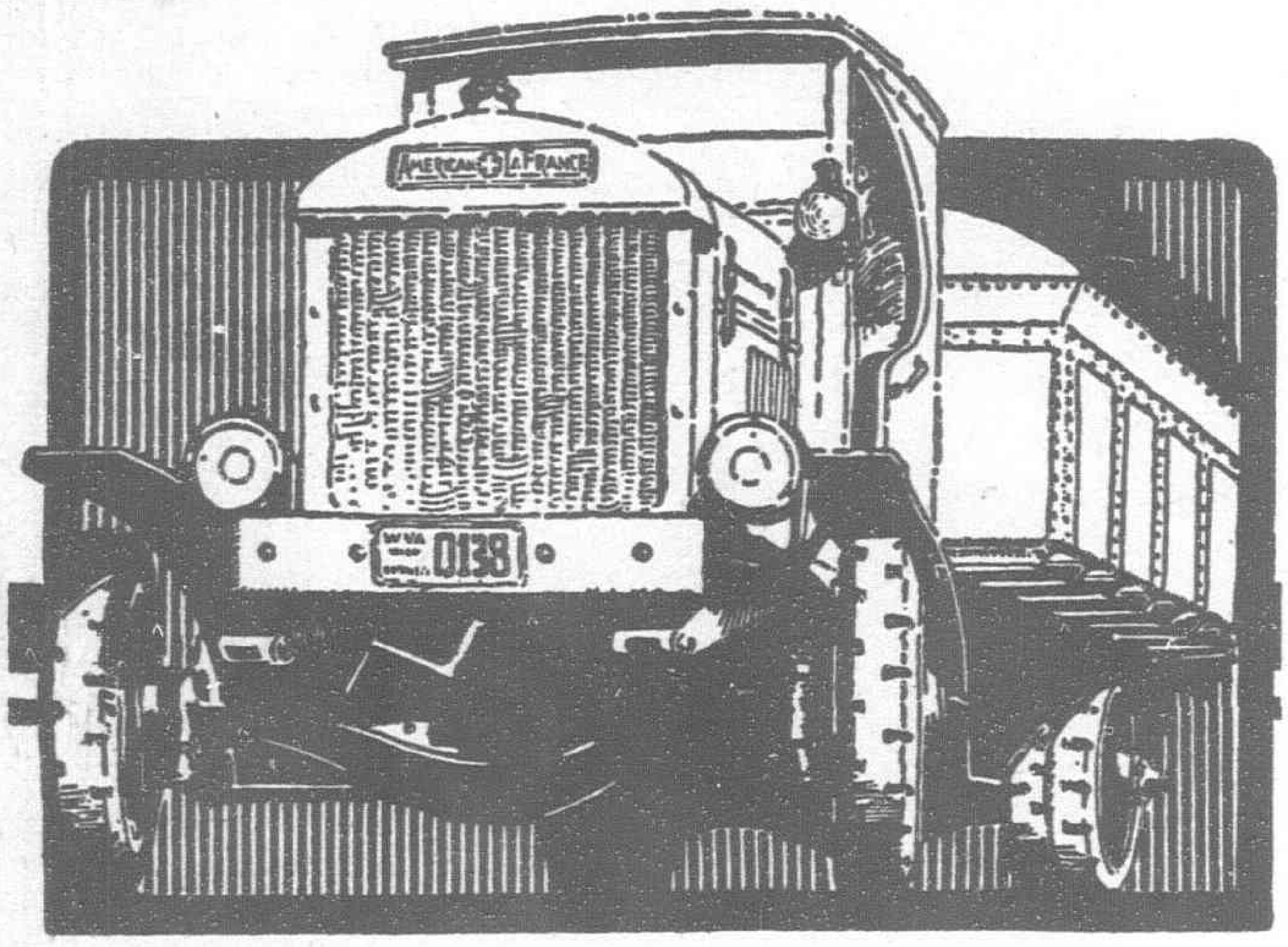
NEW DIESEL-ELECTRIC POWER STATION AT SHANGHAI

INTERNATIONAL BRIDGE AT TIENTSIN

THE SUITUNG COAL FIELD

JAPANESE PETROLEUM PRODUCTION

Vol. XXII January, 1926 No. 1



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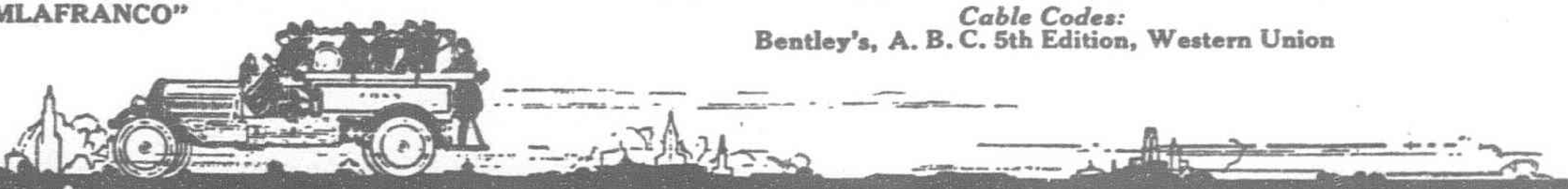

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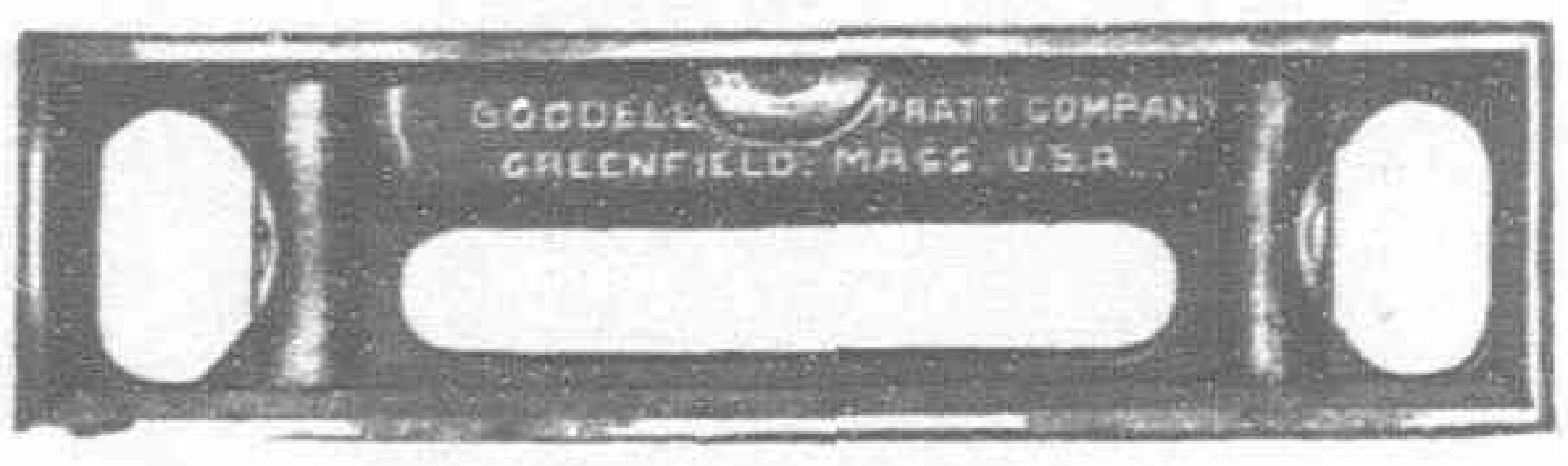

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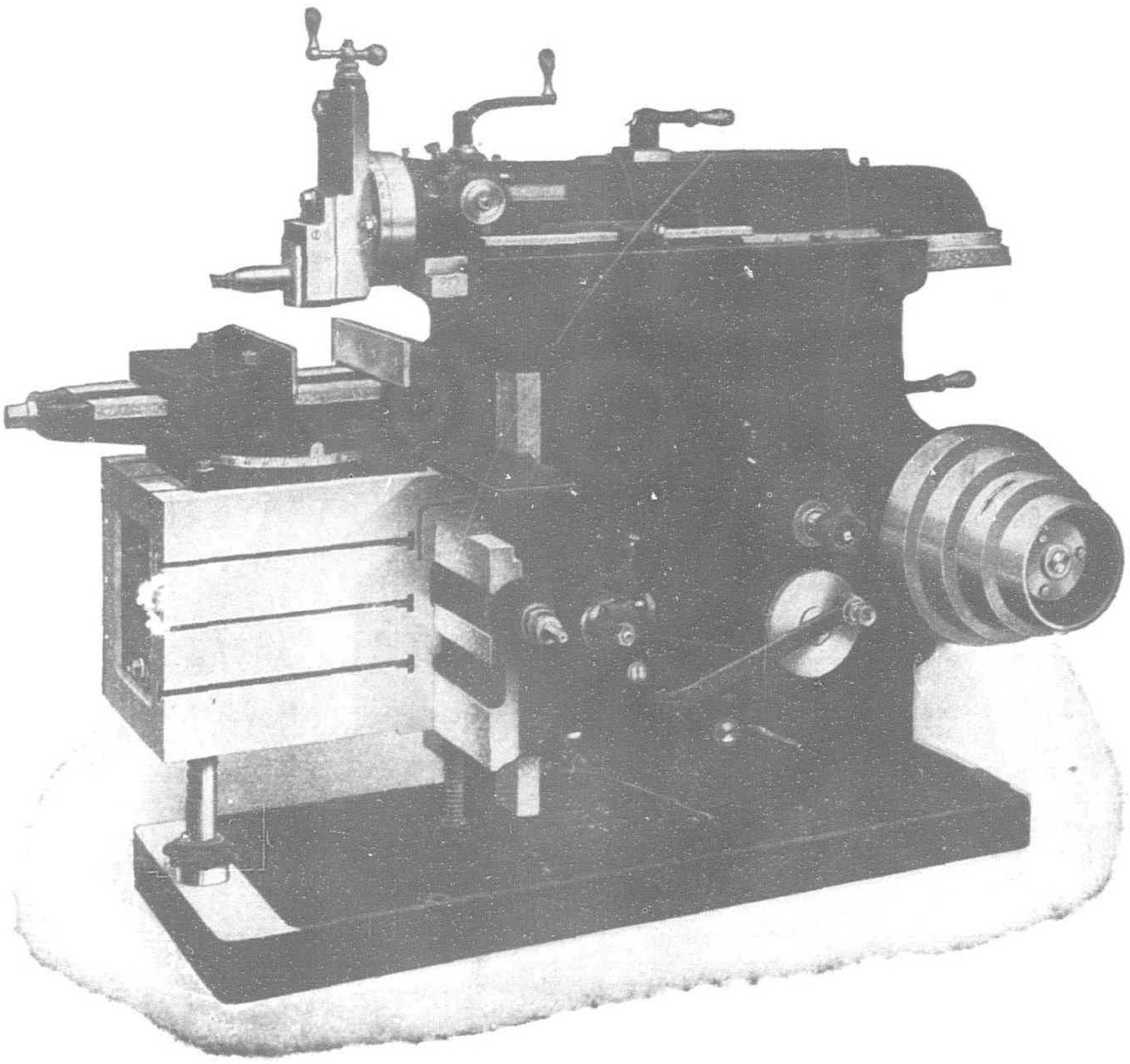

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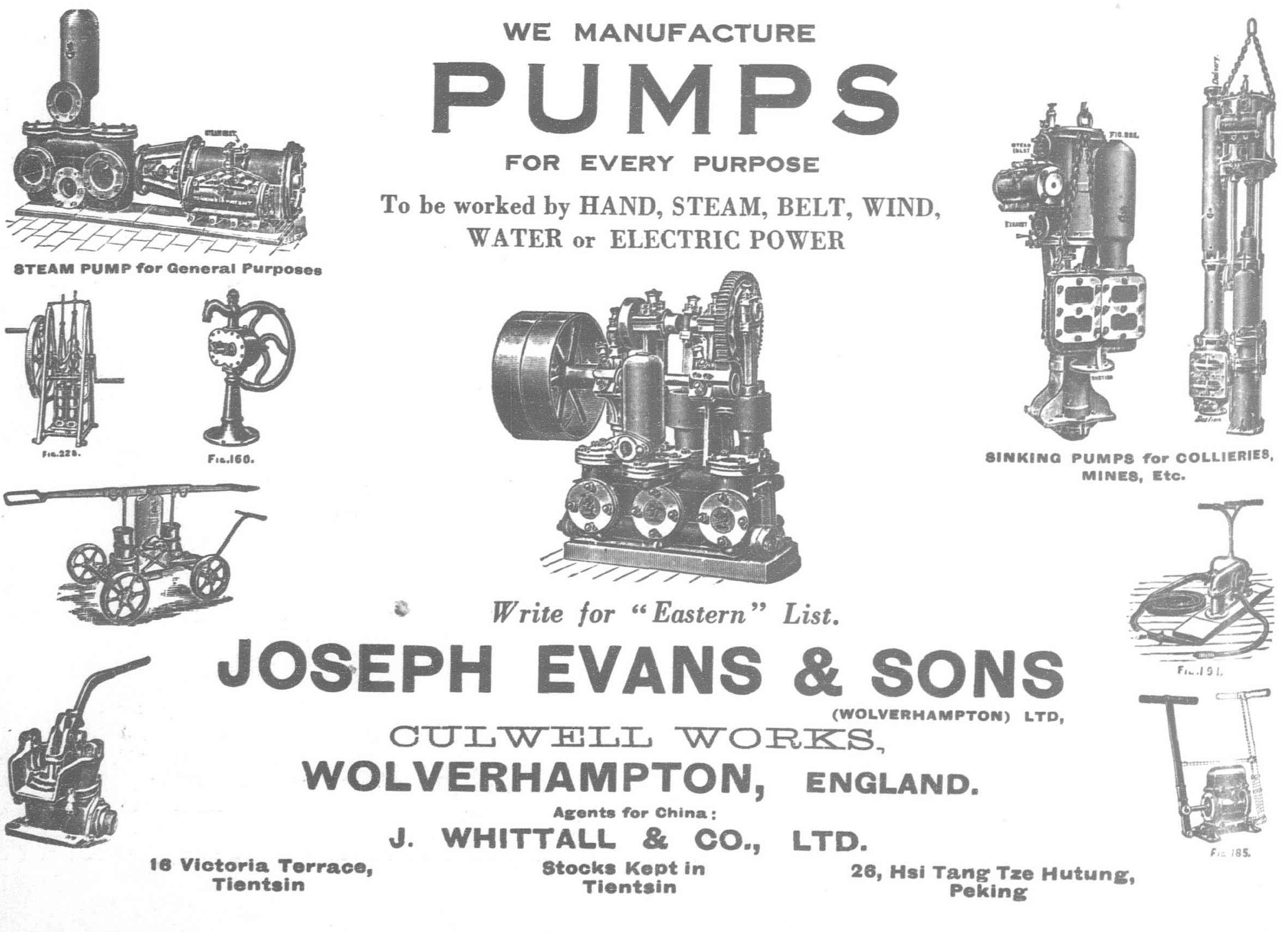

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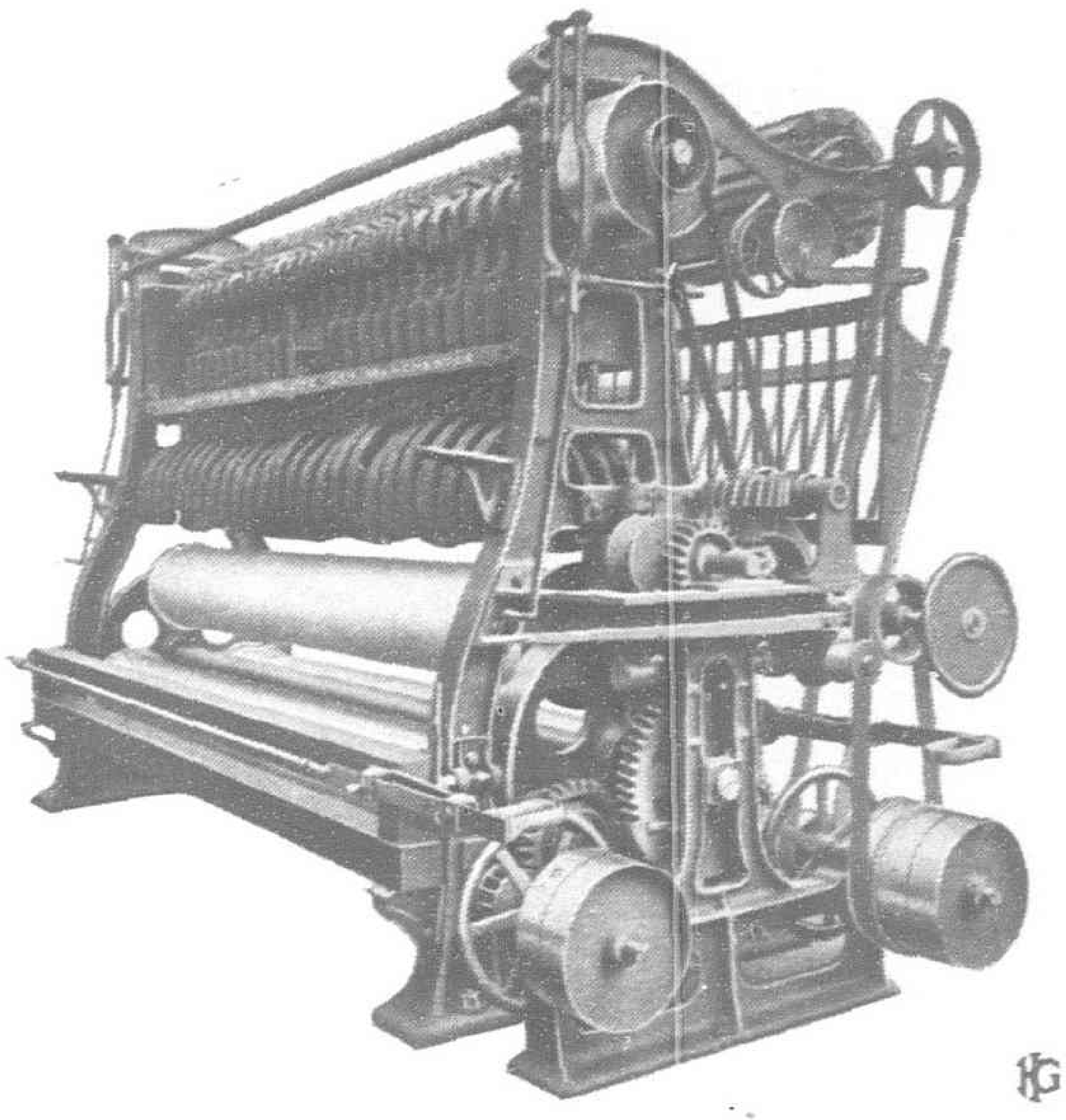

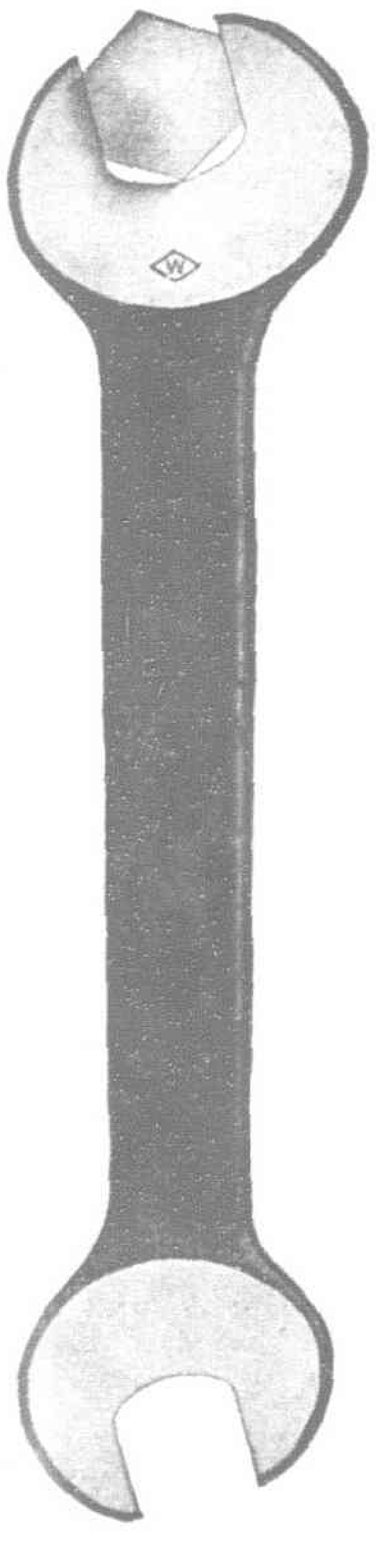

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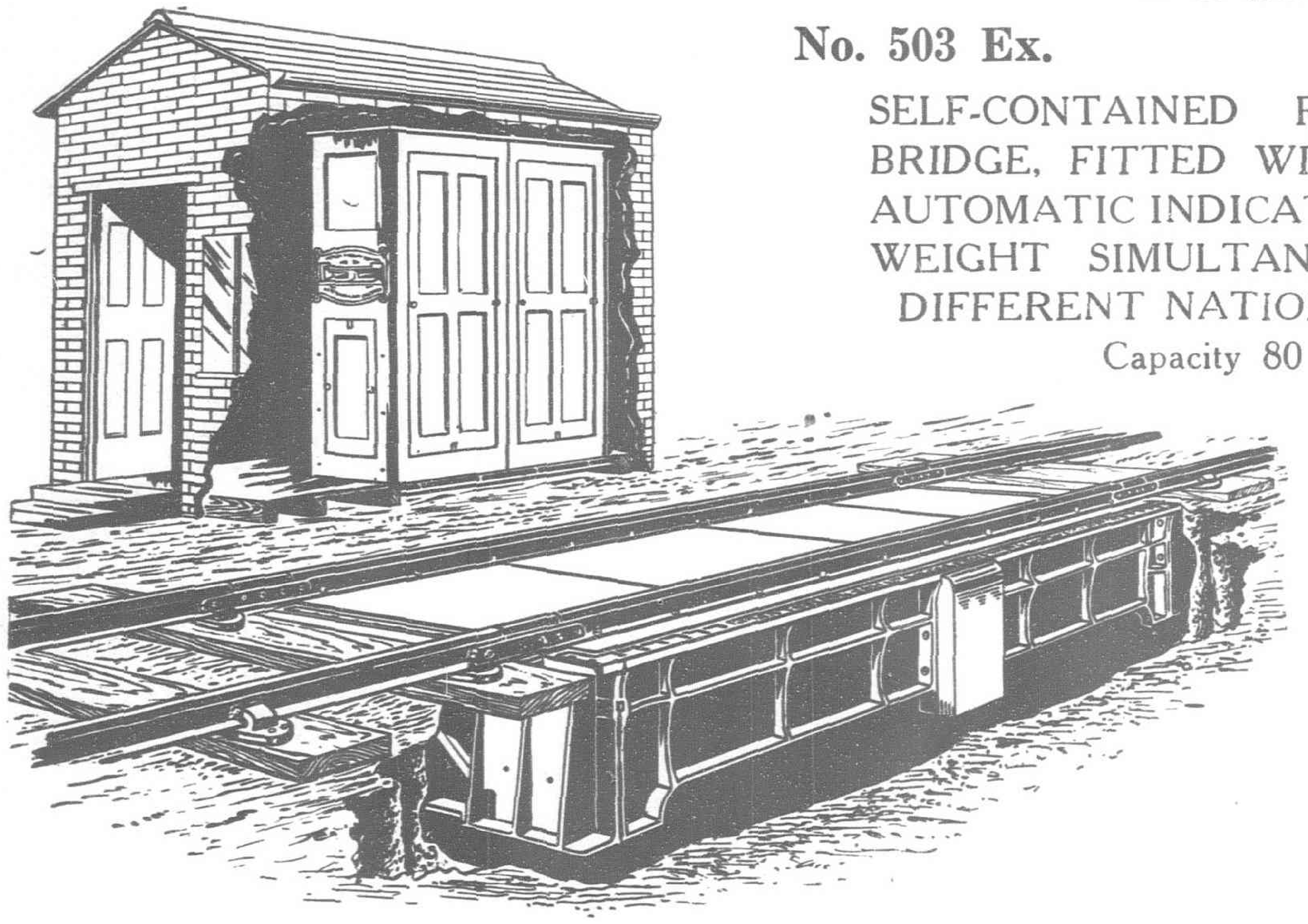

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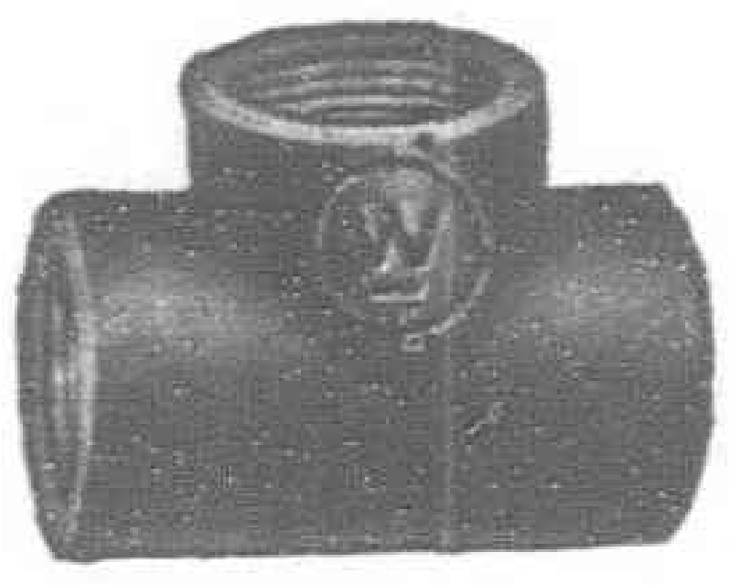

Fig. W13—Tee

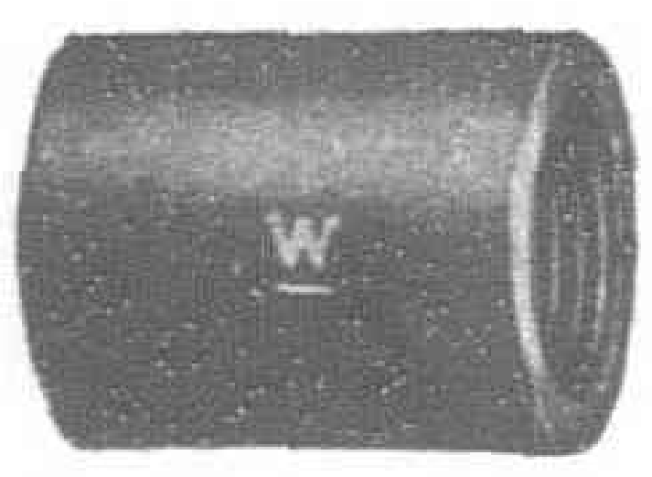

Fig. W33—Coupling

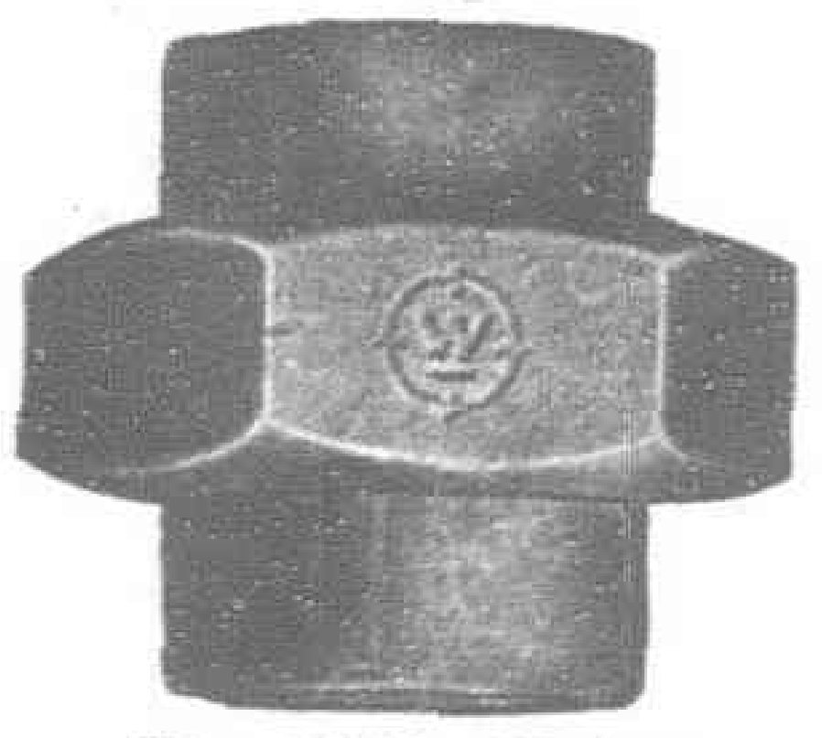

Fig. W46—Union

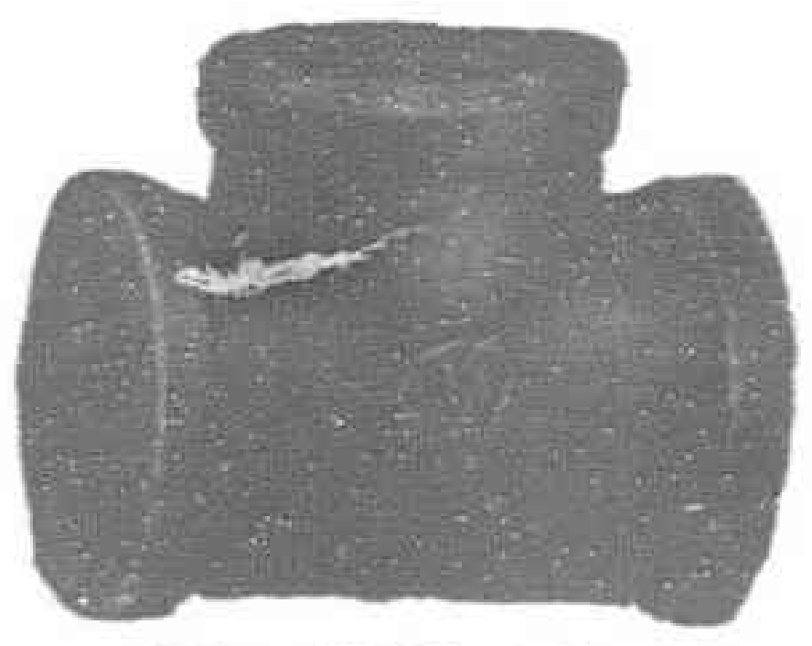

Fig. W14—Tee

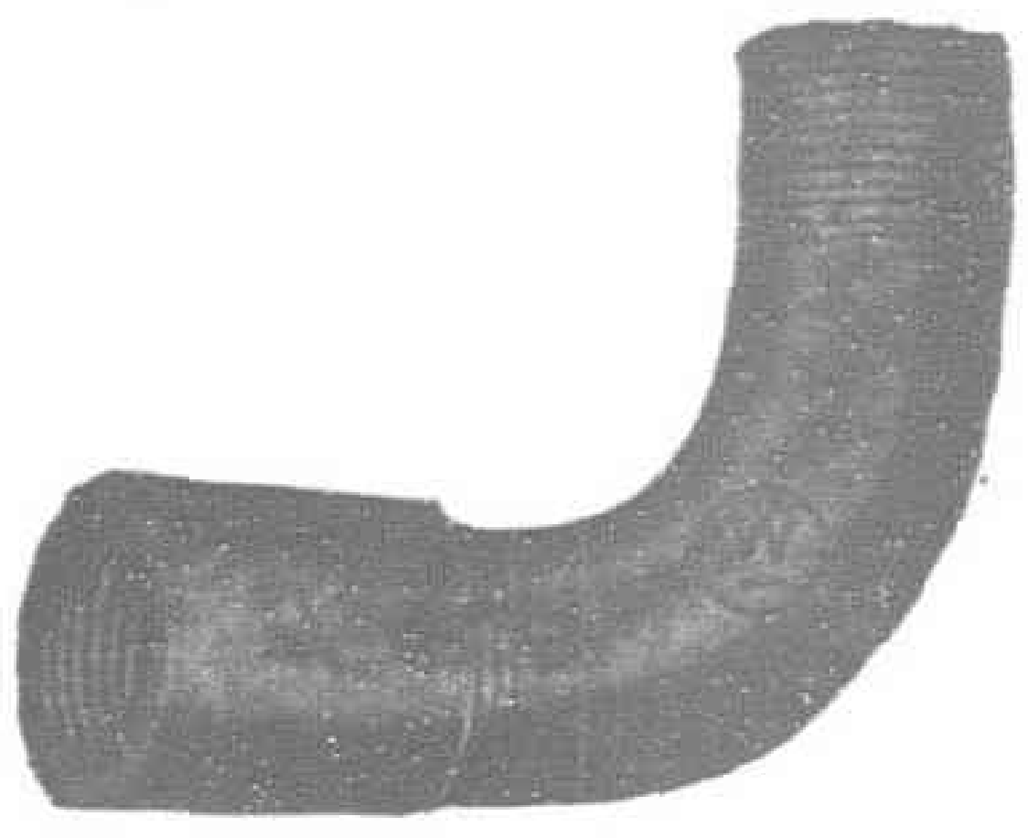

Fig. W21—Bend

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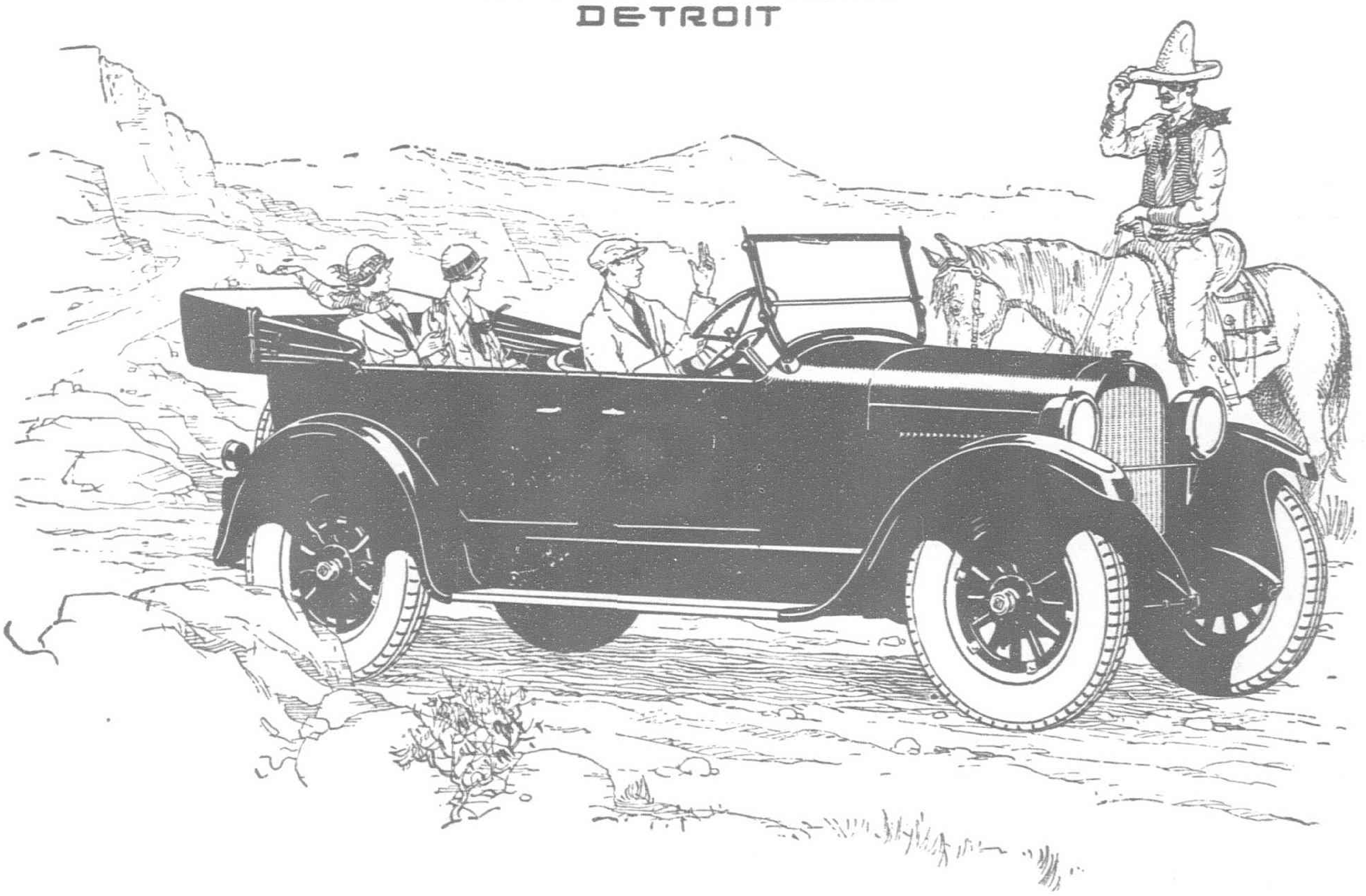

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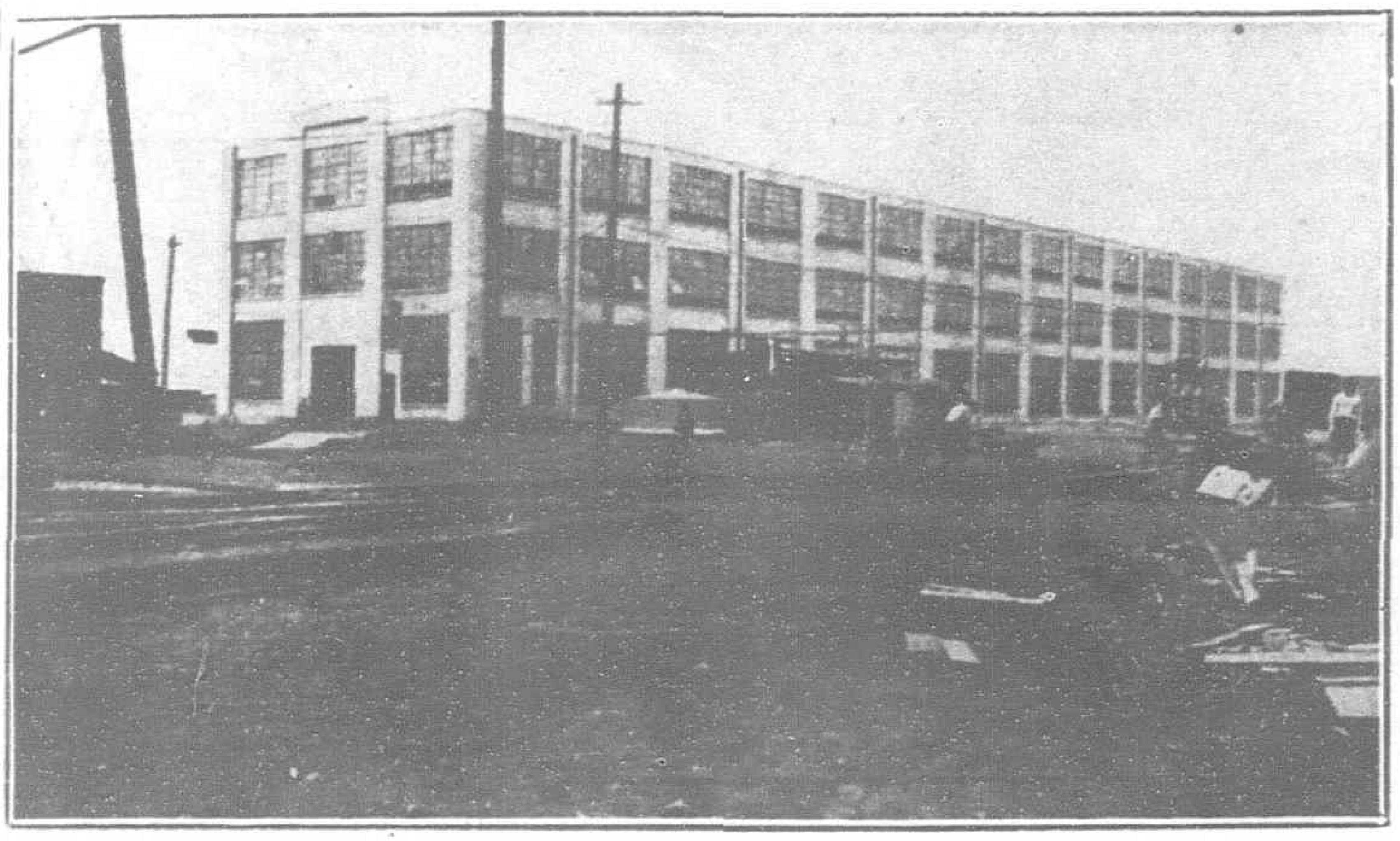

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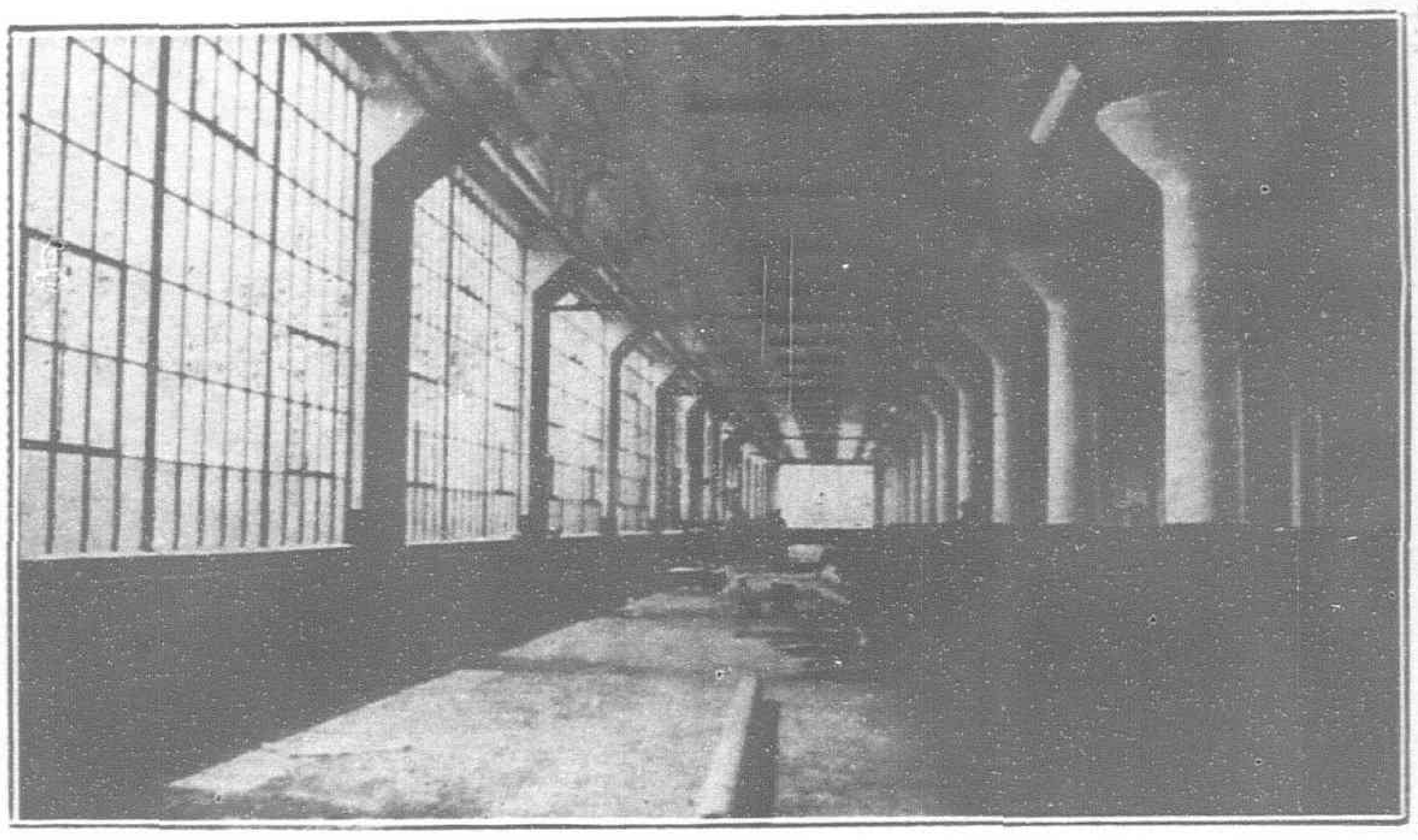

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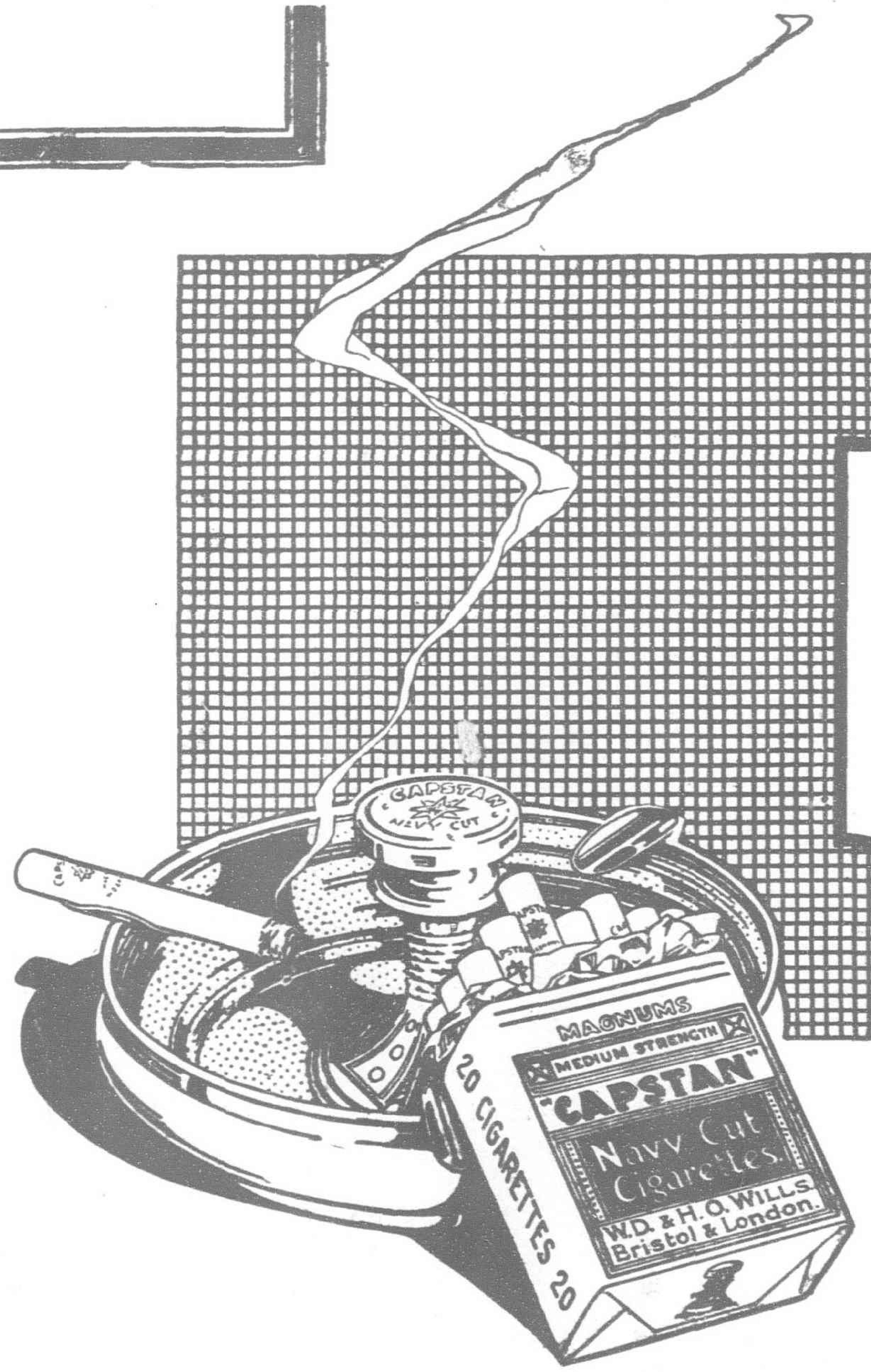
AVIATION EQUIPMENT: Handley Page, Ltd.
BRITISH STEEL and STEEL PRODUCTS. Jonas and Colver, Ltd., Smith & Coventry, Ltd., Sheffield Twist Drill & Steel Co., Ltd., Chubb & Son's Lock & Safe Co., Ltd.
CANNING MACHINERY and EQUIPMENT. American Can Co., Adriance Machine Works, Anchor Cap & Closure Co., Burpee and Letson Ltd., Seeley Brothers.
CANNED SALMON and CRAB from Kamchatka.
Fairbanks Morse & Co. Stationary and Marine Engines. Motors. Pumps, Wind Mills, complete Power and Lighting Plants.
Chain Belt Co., "Rex" Concrete Mixers.
J. L. Mott Iron Works, Plumbing Fittings and Supplies.
Shepard Electric Crane & Hoist Co., Cranes and Hoists.
Armour & Co., Canned Meats and Fruits, Soaps, Toilet Articles.
The Carnation Milk Products Co., "Carnation Cream."
The Glidden Co., Paints, "Jap-a-lac" Auto Finishes, Cold Water Paints, Wood Stains.
The Duratex Co., "Duratex" Leather Substitute and Rubber Coated Top and Curtain Materials.
S. C. Johnson & Son, Floor Wax, Paste, Liquid, and Powder.
The Klein Manufacturing Co., Technical Paints "Metal Crete" Concrete Hardeners, Cement Coating.
The Tungsten Wire Works (Stockholm), Wires for Filaments.
The Victor Talking Machine Co., Machines and Records.
The Graphoscope Development Co., Projectors and Films.
The Victor Typewriter Co., Standard Typewriters.
The Corona Typewriter Co., Folding Typewriters.
The Rolex Watch Co., Ltd., "Rolex" Watches.
Simmons Hardware Co., "Keen Kutter" and "Oak Leaf" Brands of Tools and Cutlery.
The Gillette Safety Razor Co., "Gillete" Blades.
ROAD, EXCAVATING, POWER HOUSE, REFRIGERATING MACHINERY: STEEL and IRON PRODUCTS: "Gould" STORAGE BATTERIES.
RADIO APPARATUS, HEATING EQUIPMENT, FERTILIZERS, SAWN TIMBER CHEMICALS.
OUR SERVICE also covers BONDS and INVESTMENTS, FIRE and MARINE INSURANCE, SHIPPING, STORING, CHARTER, SALE and PURCHASE of STEAMERS.

INQUIRIES SOLICITED . If we cannot Supply your Requirements from Stock, we will be pleased to Recommend Local Alternatives or Advise Regarding Imports.

SMOKE

CAPSTAN



The PACKET for the POCKET

MAGNUM 20s New Packing

This advertisement is issued by the British-American Tobacco Co., (China) Ltd. B-274

JAPANESE
TEXTILES
FOR EXPORT

Standard Printed and Dyed Cotton and Silk Fabrics

SHIRTINGS SHEETINGS DRILLS
PRINTS CRETONNES FLANNELETTES
DAMASKS TOWELING CREPES
ETC. ETC.

PONGEES BROCADES SATINS
CREPES SILKS

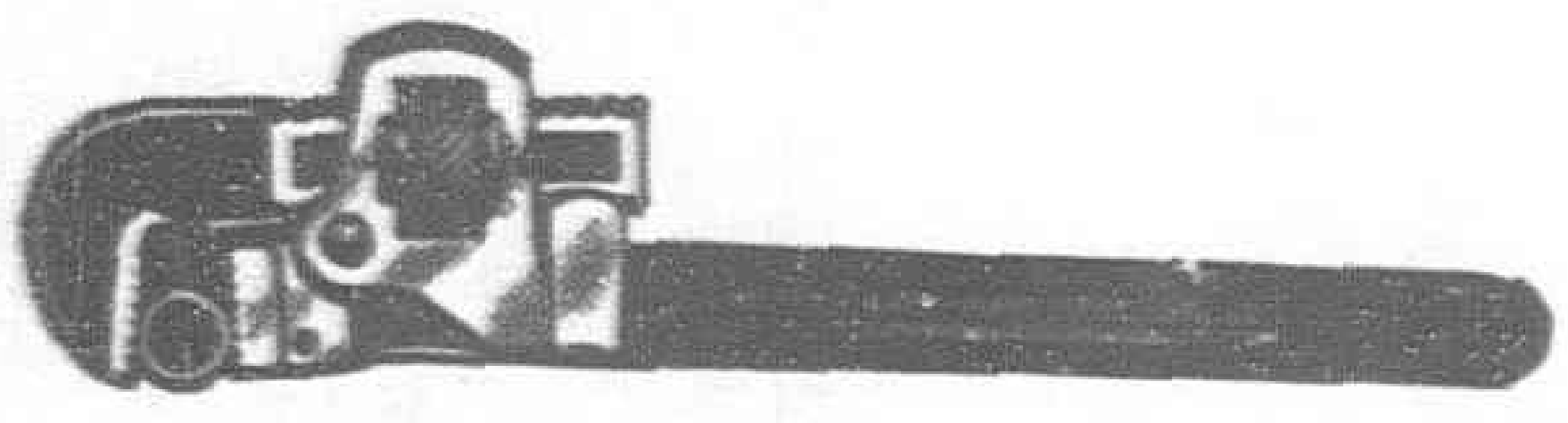
FUJI GASSED SPINNING COMPANY, LIMITED
(FUJI GASU BOSEKI KABUSHIKI KAISHA)

Head Office:
GOCHOME, OSHIMA-MACHI
NEAR TOKYO
CABLE ADDRESS: "FUHO"

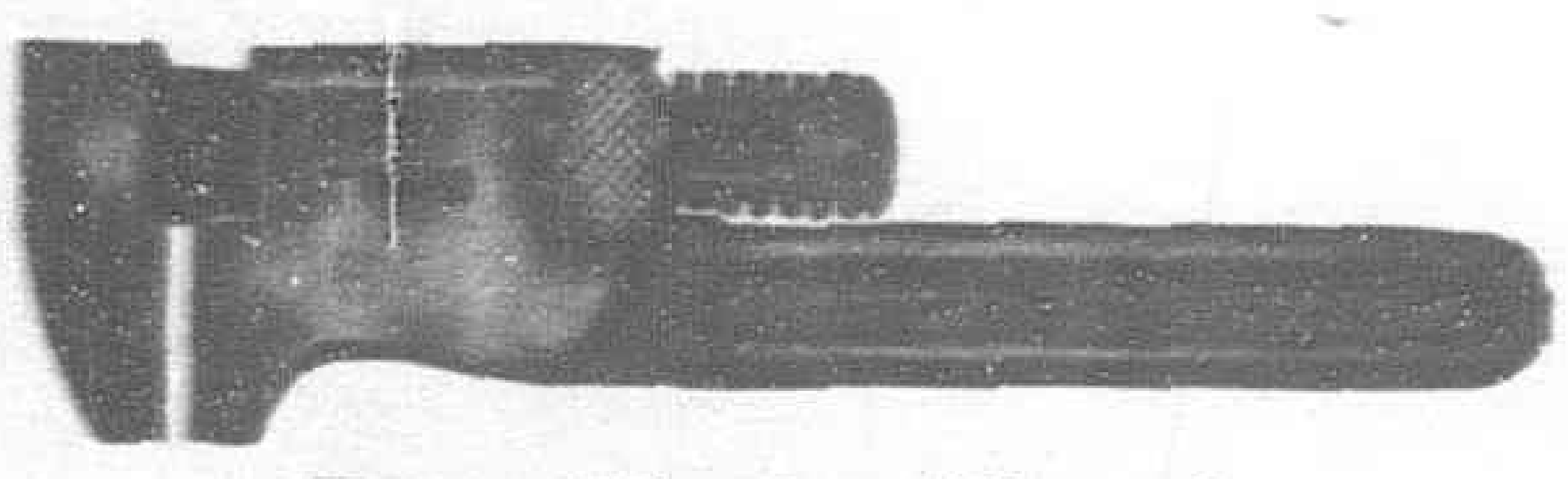
CAPITAL - Yen 38,000,000
OPERATING
450,000 Spindles and
1,775 Looms

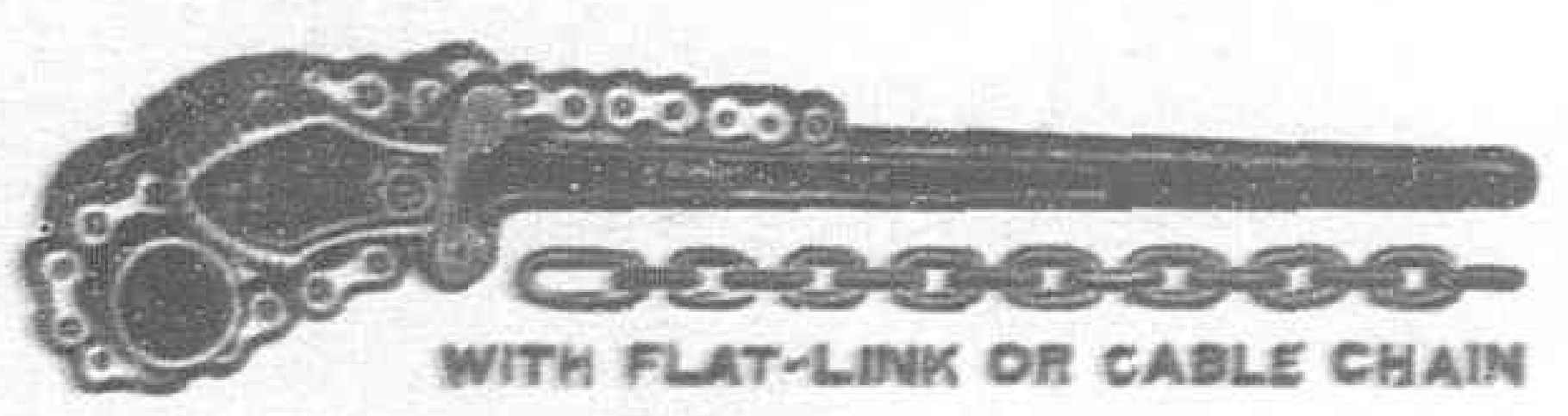
Business Office:
SHICHOME, HAKOZAKI-CHO,
NIHONBASHI-KU,
TOKYO

TRIMO TOOLS


Trimo Pipe Wrench
in 8 sizes take pipe up to 8 inches

Trimo Pipe Cutter
in 3 sizes cut pipe up to 3 inches


Trimo Monkey Wrench
made in 7 sizes—6-in. to 21-in.


WITH FLAT-LINK OR CABLE CHAIN
Trimo Chain Wrench
in 8 sizes take pipe up to 16 inches

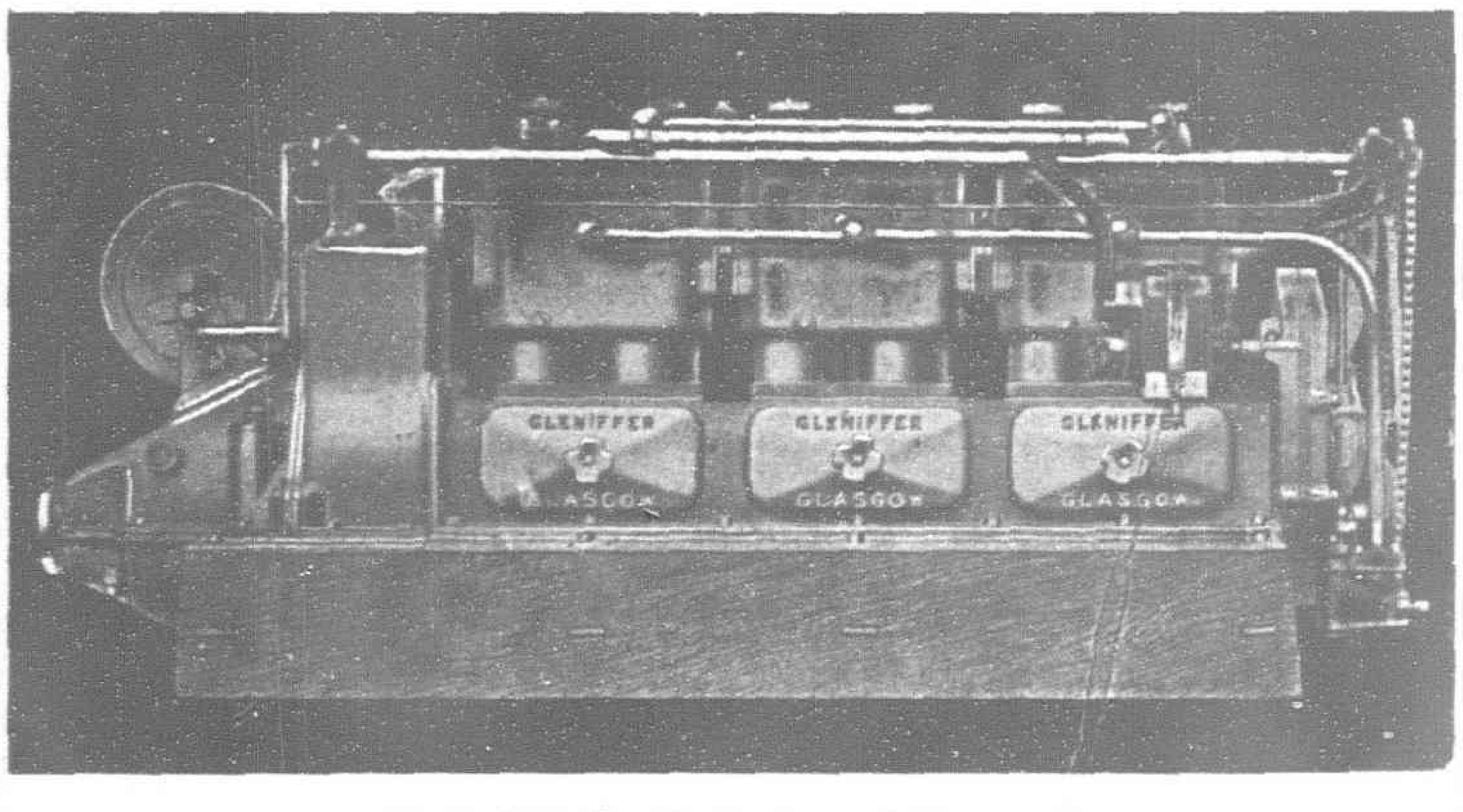
These four superior tools should be in the hands of every user and on the shelves of every seller.

They are made on honor and sold fully guaranteed by the manufacturer.

Can be had through any importer of hardware.

Manufactured By:
TRIMONT MANUFACTURING CO.
Established since 1888 at
ROXBURY (Boston), Mass., U. S. A.

GLENIFFER
MARINE MOTORS


36/42 H.P. Paraffin Engine and Reverse Gear

A sound British engineering job of compact and clean design. All working parts entirely enclosed, thus ensuring silent and clean running.

Range of Models—12 to 90 H.P.

Agents: China and Hongkong—THE JARDINE ENGINEERING CORPORATION, LTD., at Shanghai and Hongkong.
F.M.S. & Straits Settlements—Ritchie & Bisset, 23-25 The Arcade, Singapore

GLENIFFER MOTORS, LTD.,
ANNIESLAND, GLASGOW, SCOTLAND

THERE IS NO WEIGHING, COUNTING, OR TESTING PROBLEM WHICH CANNOT BE SOLVED BY THE AVERY SERVICE.

THE NAME AVERY UPON ANY SCALE OR WEIGHING APPLIANCE IS ACCEPTED AS A GUARANTEE OF ITS EFFICIENCY AND UTILITY THE WORLD OVER.

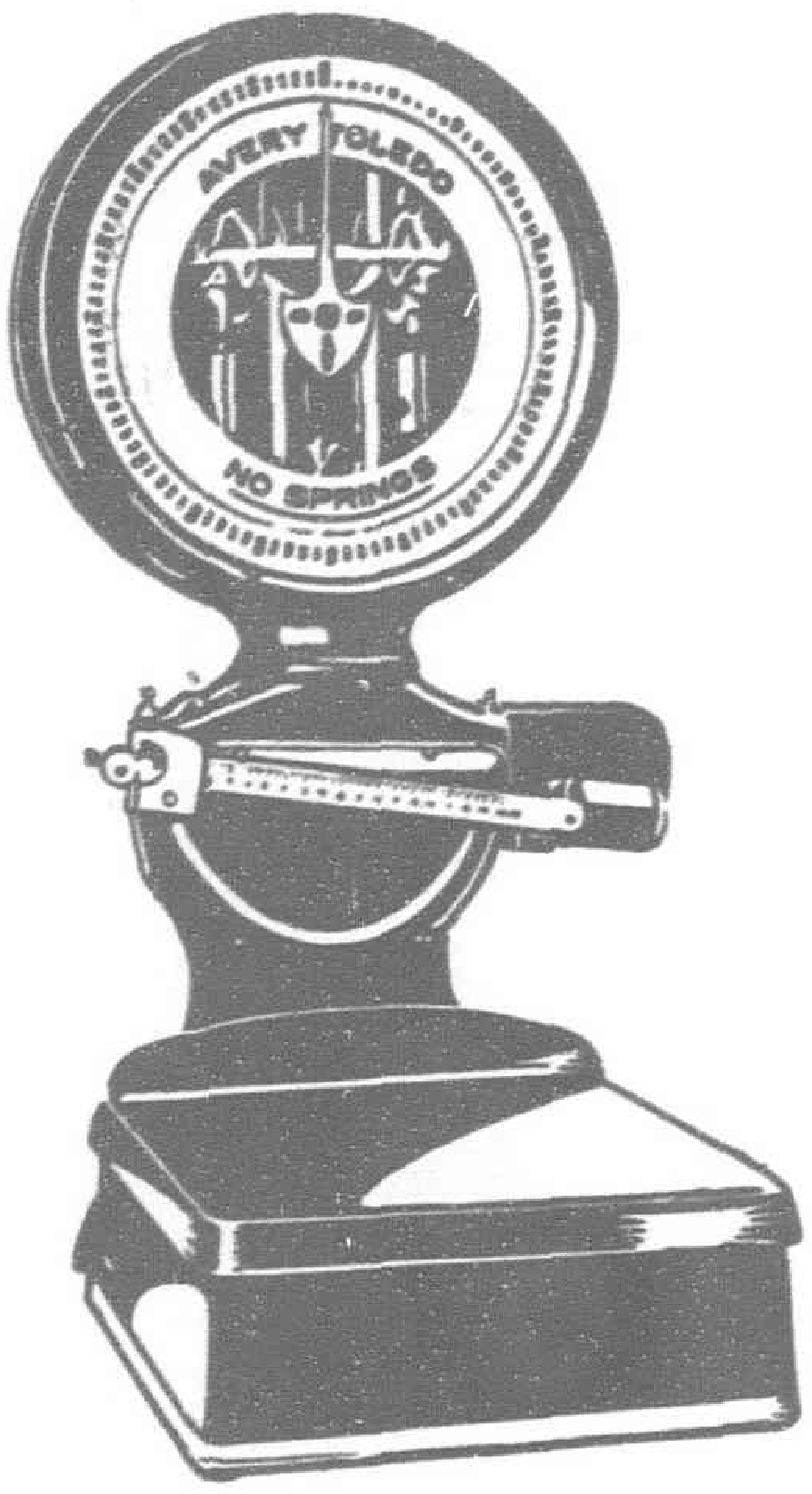
RAISE THE STANDARD OF YOUR PLANT EFFICIENCY AND MAINTAIN OUTPUT WITH ECONOMY AND EFFICIENCY BY INSTALLING THESE WORLD FAMOUS WEIGHING MACHINES.

LIST 276 TELLS YOU HOW TO UTILIZE THE AVERY SERVICE WITH BENEFIT TO YOURSELF. WRITE TODAY TO EXPORT DEPT.

W. & T. AVERY L^TD
SOHO FOUNDRY
BIRMINGHAM.
ENGLAND

AD.779

Solve Your Weighing Problems



THE
AVERY
No. A114
BENCH
PLATFORM
WEIGHER

AVERY

Agents for China,
The Jardine Engr
Corporation Ltd.
Shanghai.

Maxchip Chisel Steel

withstands heavy and repeated blows

Maxchip Chisel Steel has been specially designed by Edgar Allen & Co., Ltd., for making tools that have to withstand heavy and repeated blows. Its chief characteristic is its air-hardening property, which avoids the danger of water-cracking and the necessity for tempering. Other characteristics are extreme toughness and ability to resist shock. It will also take a keen cutting edge on hardening. Being easy to manipulate, it is in consequence particularly suitable for all classes of hand tools, such as chisels, sates, etc.

What an engineer says of it:

The Chief Engineer of an important Colonial Cement Company writes:—"Regarding the sample chisel which you sent us for trial, made of Edgar Allen Maxchip air-hardening steel, the test to which this was subjected proves the steel to be eminently suitable for cold chisels. By some misunderstanding the test was more severe than was intended. The chisel was held with a pair of boilermaker's tongs, and a plate one quarter of an inch thick and two feet wide was cut through in the same manner as with a boilermaker's cold set. It was then ground as a side set, and twelve three-quarter inch rivets cut from an iron girder. This work was then stopped, as being unnecessarily severe; the chisel was reground and used on legitimate work in the fitting shop. Apparently, however, it is none the worse, and is certainly a remarkably high-quality steel and well worth the extra cost, aside from the saving in time—and uncertainty—in being self-tempering."

"Special Alloy Tool-Steels," a 28-page booklet, contains full particulars of this and many other important steels. Post this request form to obtain your copy.

Edgar Allen & Co., Ltd. Imperial Steel Works, SHEFFIELD

Branch Office in Japan:
EDGAR ALLEN & CO., LTD.
2 Mitsu Bishi Buildings, 1 Yaesu Cho,
Kojimachi Ku, Tokyo

Agents in China:
THE JARDINE ENGINEERING CORPORATION, LTD.
8a Yuen-Ming-Yuen Road, Shanghai
and at Hongkong, Tientsin, Hankow,
Peking, etc.

To Edgar Allen & Co., Limited, Imperial Steel Works, Sheffield. Please post "Special Alloy Tool-Steels" to:—

Name ....
Firm ....
Address ....
....
..............................F.E.R.

THE JARDINE ENGINEERING CORPORATION, LTD

(Incorporated under the Companies Ordinances of Hongkong.)

Registered Office: 8a YUEN-MING-YUEN ROAD, SHANGHAI

Branches: Hongkong, Hankow, Tientsin, Peking, Harbin, Mukden and Taiyuanfu

ENGINEERING SUPPLIES AND MACHINERY

LARGE STOCKS CARRIED IN

SHANGHAI, HONGKONG, HANKOW, TIENTSIN

Including:—

MACHINE TOOLS OF EVERY DESCRIPTION,
STEAM ENGINES AND BOILERS,
GAS, GASOLINE AND OIL ENGINES,
PUMPS, TOOL STEELS, PULLEYS,
SHAFTING, BELTING, PAINTS,
"CHUBB" SAFES AND LOCKS,
"AVERY" WEIGHING MACHINES,
WIRE ROPES FOR ALL PURPOSES,
ELECTRIC LIGHTING SETS, MOTORS
AND ELECTRIC ACCESSORIES,
DIVING APPARATUS, Etc. Etc.

EXPERT STAFF IN SHANGHAI

CONTRACTORS

FOR THE SUPPLY OF

COTTON SPINNING AND WEAVING MACHINERY, FLOUR AND CORN MILLING MACHINERY, ELECTRIC LIGHT AND POWER PLANTS, INDUSTRIAL PLANTS FOR ALL PURPOSES

DESIGNERS AND BUILDERS OF MOTOR BOATS

ESTABLISHED 1835

HORSFALL & BICKHAM, LTD.

MANCHESTER, ENGLAND

MANUFACTURERS OF ALL KINDS OF

CARD CLOTHING

CARD WIRE, CARD CLOTH FOUNDATIONS
CARD GRINDING MACHINERY
AND

EMERY FILLETING (HORBICK BRAND)

SOLE AGENTS IN CHINA:
THE JARDINE ENGINEERING CORPORATION LIMITED, SHANGHAI.

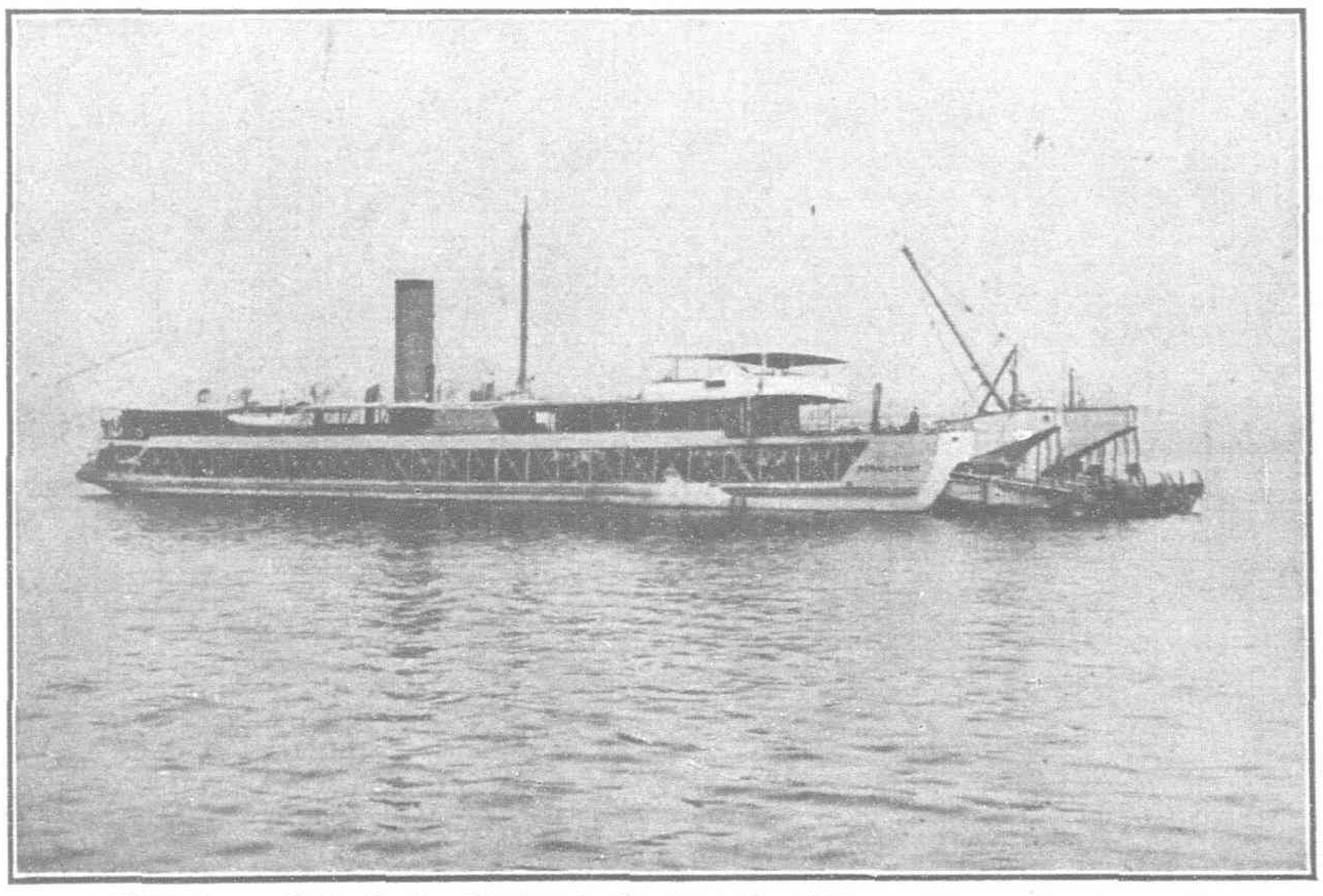
STOCKS CARRIED IN SHANGHAI AND TIENTSIN.

Wm. Simons & Co., Ltd., Renfrew

CONSTRUCTORS OF

Marine Dredging Plant of most Modern and Improved Types and of the Greatest Capacities.

Constructors of Barge Loading, "Simons" Reclamation, Canal and Suction Cutter Hopper Dredgers. Hopper and Barge Loading Bucket Dredgers. Alluvial Dredgers. Trailing Suction Dredgers.



Triple Screw Cutter Suction Discharging Dredgers *Ronaldshay* and *Cowley* Constructed for the Government of India.

Builders of Dipper and Drag Line Dredgers of Latest Type.

Propelling and Dumb Hopper Barges.

Replace Parts supplied or fitted to existing Dredgers.

Inventors and First Constructors of "Hopper" and "Sternwell" Dredgers and Elevating Deck Ferry Steamers.

Telegrams:
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Established 1810

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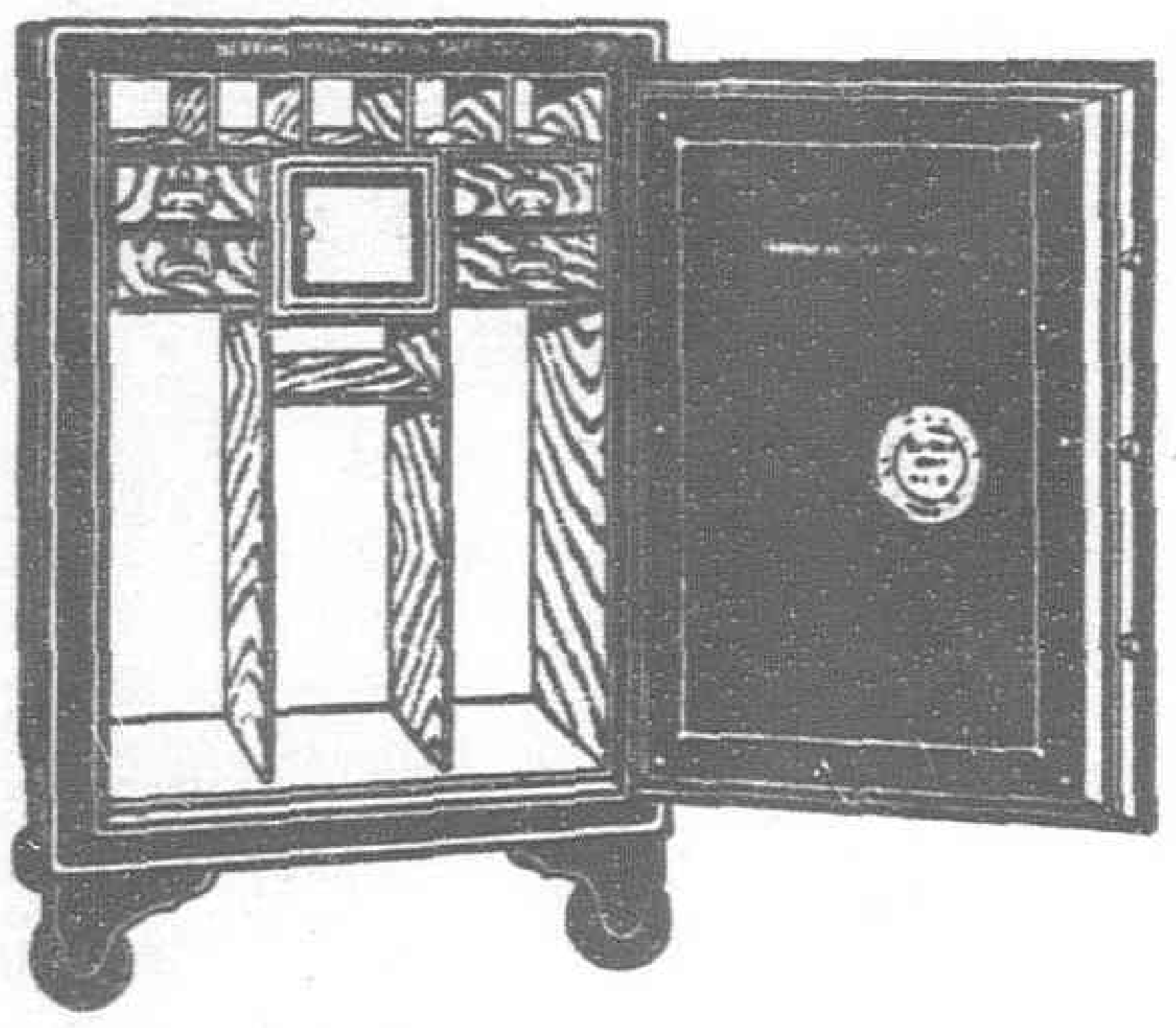
THE JARDINE ENGINEERING CORPORATION, LTD.

8a Yuen-Ming-Yuen Road
Shanghai.

and at
Hongkong, Tientsin, Hankow, Peking, etc.



Unfailing
Protection
For Your
Most Valued
Possessions

HERRING-HALL-MARVIN

Safes and Bank Vaults

All sizes from the smallest Home Safe to the largest Bank Vaults, Key-Lock or Combination.

MUSTARD & COMPANY, LTD.

Sole Agents for China, Hongkong and Macao.

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The JANNEY-PENN Coupler

THE latest development of the Janney type of M. C. B. Coupling originally introduced and promoted by this company. This coupler has all the simplicity of the early type of the Janney coupler, and also has the up-to-date features of a "Lock-to-the-Lock," "Lock-Set," and a "Knuckle-Opener," and complies fully with all the requirements and recommendations of the M. C. B. Association of the U. S. A.

This coupler has the desirable feature of easy accessibility of parts, thus facilitating the making of repairs.

Furnished with various designs of rear end to suit different types of Draft Rigging.

Manufactured exclusively by

THE McCONWAY & TORLEY CO.

Pittsburgh, Pa., U. S. A.

Cable Address—Torley, Pittsburgh

China Agents: The Robert Dollar Co., Tientsin, Hankow and Shanghai, China

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STANDARD

Wires, Cables, Accessories

Superior Quality, Maximum Economy

Wires of Copper, Brass, Bronze Copper Clad Steel Cables with Rubber, Varnished Cambric, Paper Insulations; Braided, Lead Covered, Steel-Wire or Tape Armored.

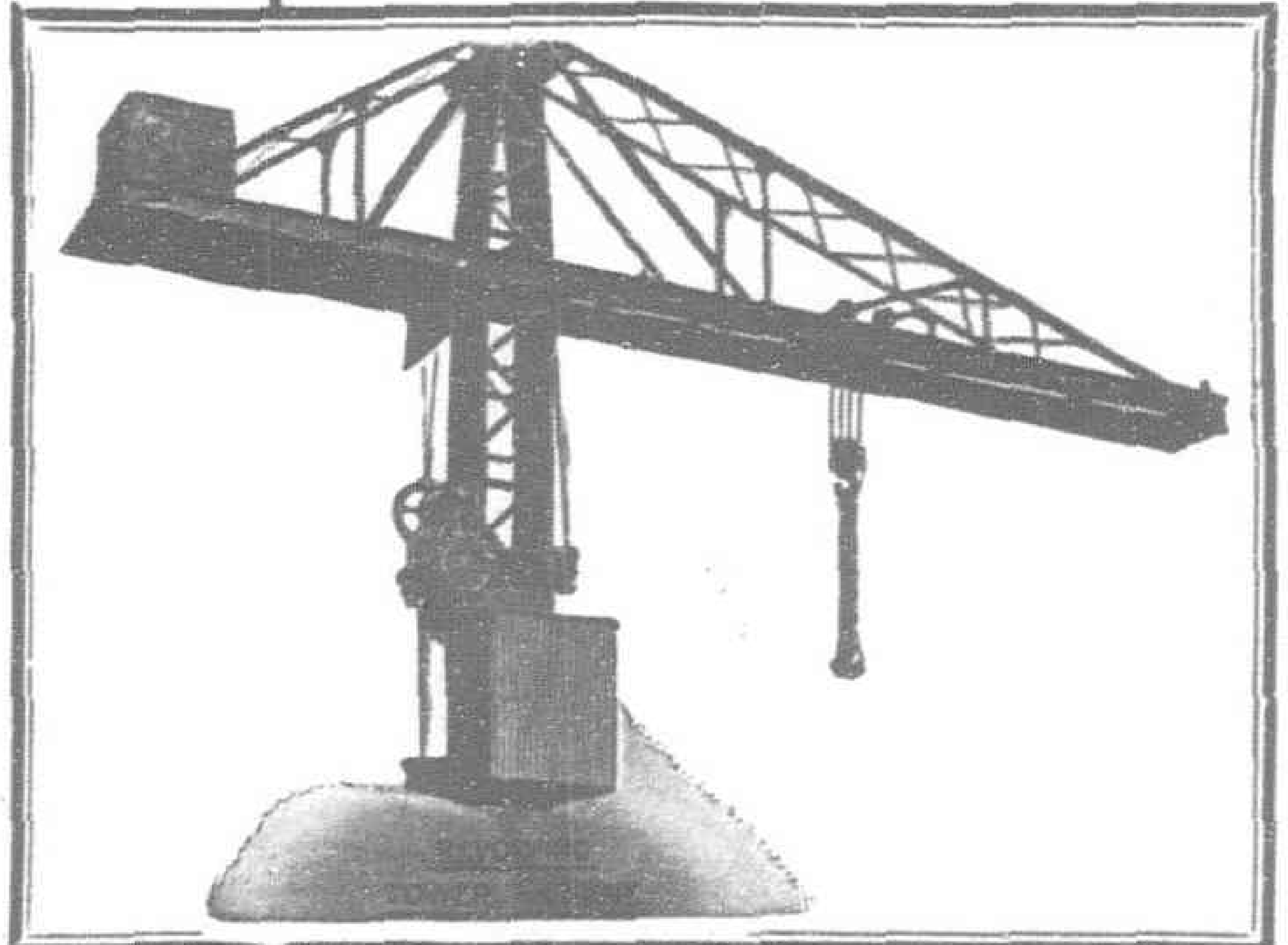
Accessories: Cable Terminals, Junction Boxes, etc.

Complete information on request.

Standard Underground Cable Co.

General Offices: Pittsburgh, Pa., U.S.A.

Agents for China: Andersen, Meyer & Co., Ltd., Shanghai



CHAMBERS, SCOTT & CO., LTD.

SPECIALISE IN

CRANES
WINCHES
HOISTING & MACHINE TOOL PLANT

SHIPMENTS UNDERTAKEN

Cablegrams: "ENERGY"
Codes: Bentley, Marconi
A.B.C. Western Union

MOTHERWELL, Nr. GLASGOW

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A Type for Every Service

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All kinds of Machinery and Moulds
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the manufacture of builder's materials

Concrete Wall and Slag Stone Machines. Machines for making concrete hollow blocks and cement slabs

Concrete Roofing-tile Machines

Moulds for pipes, Steps, Concrete Posts and other building requisites

Hydraulic and Mechanical Presses, Crushing Machines

Concrete Mixers L. C. M. Cement Pigments

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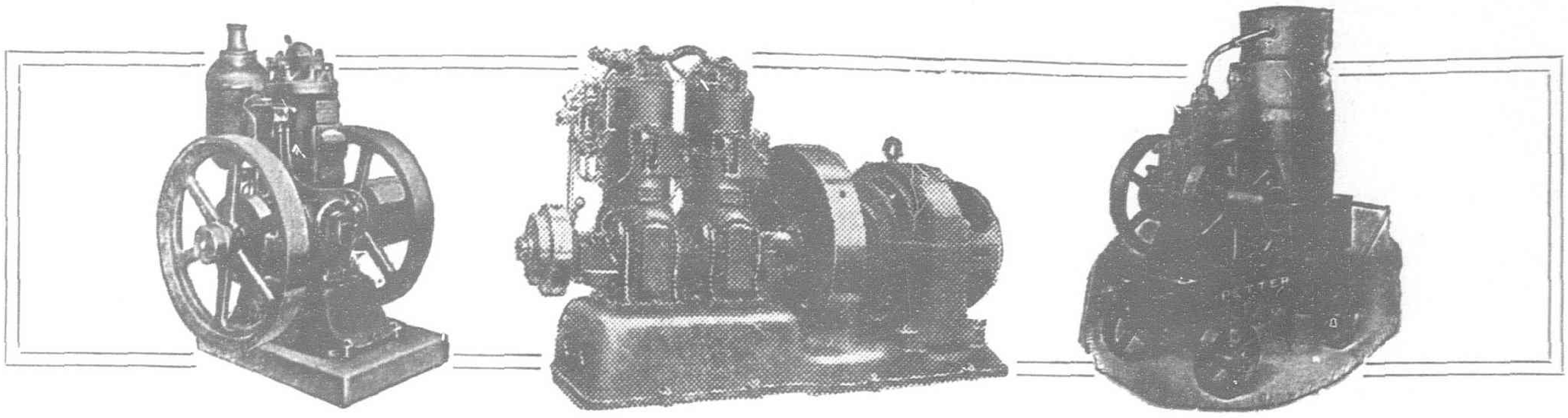
DR. GASPARY & CO.

Markranstädt near Leipzig

Please give us a call—Catalogue No. 181 gratis

Petter Oil Engines for all Purposes



PETTER 'S' TYPE ENGINES

Start and work on Crude Fuel Oil.
Self-contained. No Steam Boiler or Gas Plant. Great Saving in floor space and cost of foundations.
START FROM COLD without pre-heating.
Always ready for work.
For Factories, Electric Lighting, etc.
Sizes 5, 8, 12, 18, 24 and 36 H.P.

PETTER 'M' TYPE ENGINES

Start on Petrol—Work on Kerosene with Magneto Ignition.
Sizes 1½, 3 and 5 H.P. For Agricultural and general purposes.

THE PETTER-LIGHT ELECTRIC LIGHTING PLANTS

with Petter 'M' Type Engines are in use all over the World for Home, Shop, and Factory.

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For particulars of the larger size Engines up to 500 h.p. please write to Messrs Vickers-Petters Ltd., Ipswich

PETTERS LIMITED, OIL ENGINE WORKS, YEOVIL, ENGLAND

Information may be obtained from Rear-Admiral Yutani, c/o Mitsubishi Shoji Kaisha, Ltd., Marunouchi, Tokyo

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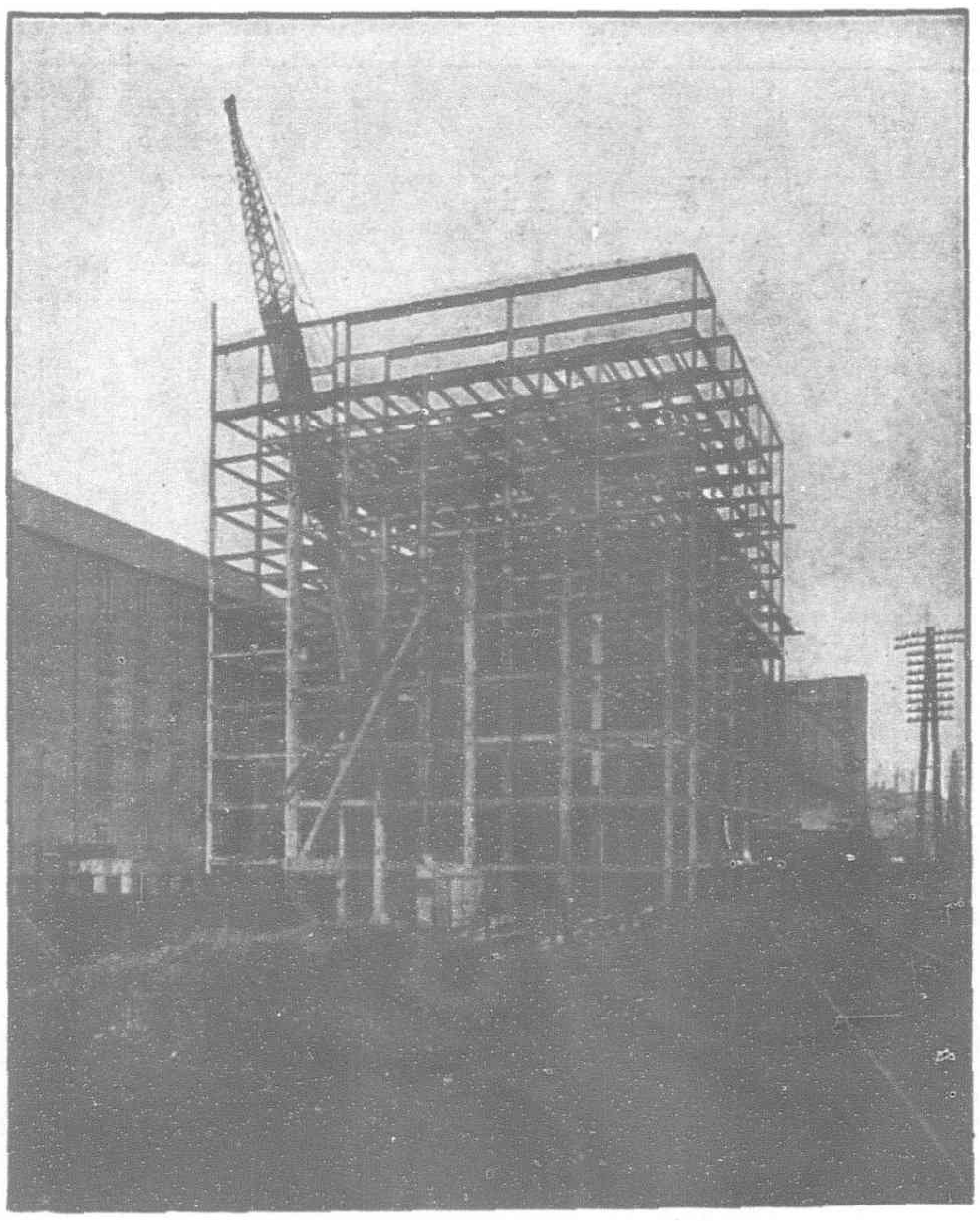

3,000 Tons Steel Frame Building of ten floors. This type of construction is suitable for all kinds of factories, warehouses, and retail stores. Fire risks reduced to a minimum.

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IN constant demand at home and abroad for all classes of building and structural work—for Factories, Sheds, Warehouses, Bridges, Garages, Godowns, and Pithead Frames. State your requirements and we will supply designs and estimates. Enquiries from architects receive immediate and special attention. With our annual capacity of over 100,000 tons and stocks of steel in hand of 20,000 tons ready for fabrication we are in a position to proceed with the work at shortest notice.

AS Steel Merchants we are also ready to supply from stock, joists, channels, angles, flats, plates, bars, bolts and rivets.

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19, Waterloo Street.

MANCHESTER:
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NEWCASTLE-ON-TYNE:
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BIRMINGHAM:
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DUBLIN:
36, St. George's Quay.

BELFAST:
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FLAKE GRAPHITE

Engineers who use Dixon's Flake Graphite regularly as a lubricant do not worry about hot boxes or scored cylinders. They know that their machines are giving better and more economical service than if lubricated with oil alone.

Dixon's Flake Graphite reduces the friction in steam cylinders and valves to the minimum, and thus lengthens the life of packing rings, prevents scoring, reduces blowing, eliminates oil from the exhaust, and saves coal.

We will send Booklet upon request, as well as the booklets checked in the panel.

JOSEPH DIXON CRUCIBLE CO.

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Established 1827

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Cup Grease
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Solid Belt Dressing
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for Gas, Water, Air, Steam, Oil, Sewage, Irrigation & other purposes

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GLASGOW BIRMINGHAM LONDON

SHANGHAI OFFICE: 6 KIUKIANG ROAD

Tarvia—for every type of road construction

Asphalt Shingles
Weather-proof rot-proof and fire-safe.

Roll Roofing
Smooth and mineral-surfaced. Come in various weights.

Everjet Paint
Protective pitch base paint for wood and all metals that rust.

Eternium Paint
Protective paint against acid and alkaline solutions.

Today Tarvia is the recognized standard of bituminous material used in highway construction and maintenance.

An excellent material for surface treating macadam roads, it is also particularly well adapted for maintenance and repair of all types of pavements. Finally, Tarvia is without equal as a binder for bituminous foundations.

There are six grades of Tarvia—a grade for every type of road construction. Each grade is uniform—refined to rigid specifications.

Write for free descriptive booklets giving detailed information.

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Dept C—40 Rector St.,
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Elesco Superheaters

Are operating in boilers ranging in capacity from 8 hp. to a nominal rating of 3,000 hp. and with every known fuel used commercially in this country.

There is a bulletin illustrating and describing Elesco superheaters in the boilers you are now using or contemplating installing.

Send for your copy today.

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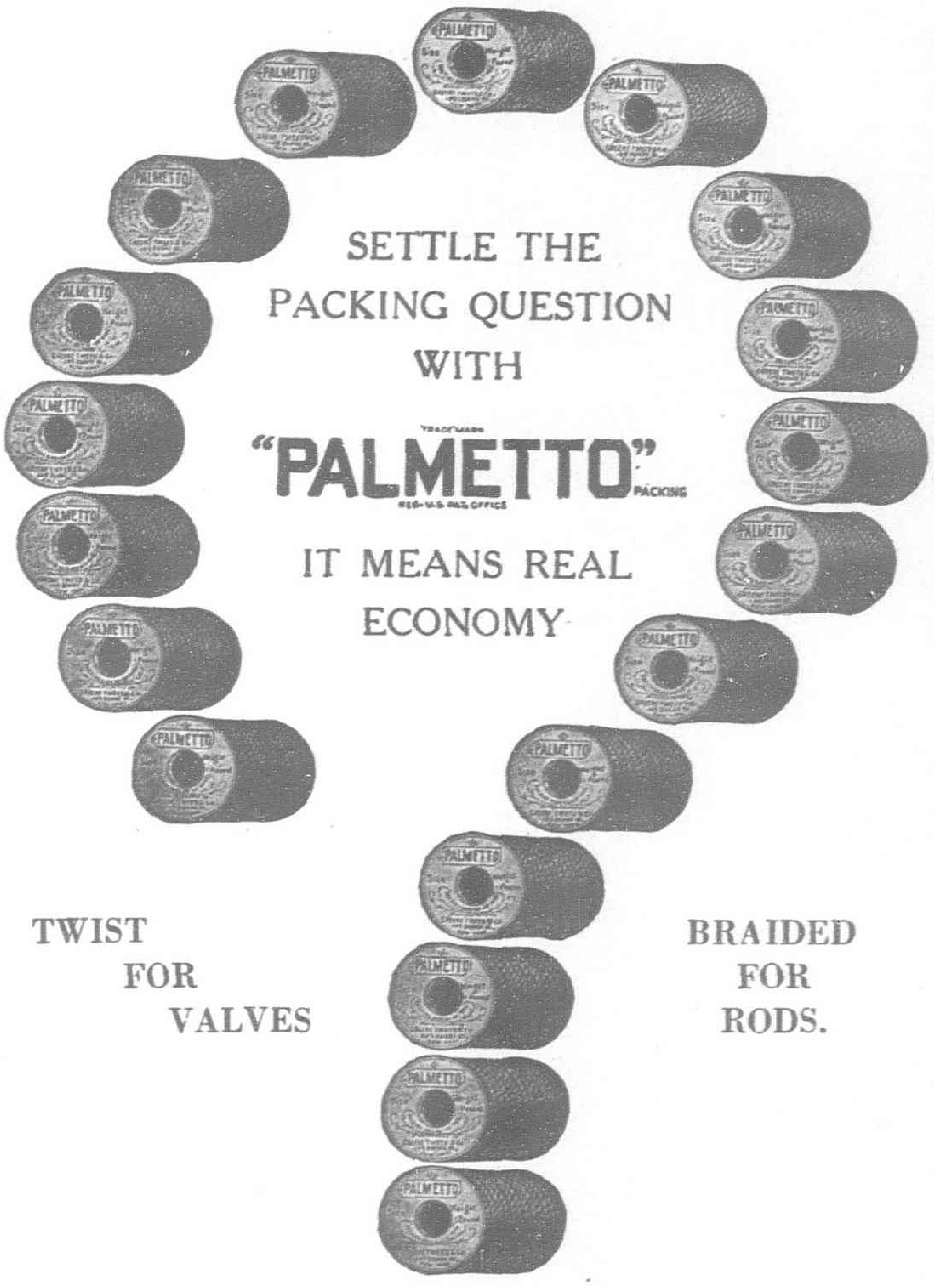

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"PALMETTO" PACKING

IT MEANS REAL ECONOMY

TWIST FOR VALVES

BRAIDED FOR RODS.

The reason "Palmetto" is more economical than other packings is because it lasts so much longer in actual service.

FOR HIGH PRESSURE, SUPERHEATED STEAM AND COMPRESSED AIR PRESSURES

"Palmetto" is practically frictionless, as its graphite grease lubricant is forced hot under pressure into each single strand.

Let us send you working samples to test for yourselves under your own conditions. No charge

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Sole Manufacturers

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Code Used :
A. 1., A.B.C. 5th, Western
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(MITSUBISHI TRADING CO., LTD.)

Capital, fully paid-up - - - Y. 15,000,000

Head Office:
MARUNOUCHI, TOKYO.

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Coal, Copper and all Other Descriptions of Metals, Minerals and Cereals, Chemicals, Oil, Paper, Glass, Canned Fish, Silk Goods, and General Oriental Products and Merchandise

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Iron, Steel, Machinery, Machine Tools, Chemicals, and General Merchandise

ANNUAL PRODUCTION:

Electrolytic Copper Ingots	20,000	Tons
Pig Iron	100,000	,,
Steel	50,000	,,
Coal	3,500,000	,,

COLLIERIES:

Takashima, Ochi, Yoshinotani, Kishidake, Namazuta, Shinnew, Hojo, Kanada, Kamiyamada, Ashibetsu, Bibai, O-Yubari, and Sakito

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STEAMSHIP DEPARTMENT—KOBE

Fleet Owned	25,000	Tons Gross
Chartered Steamers	12,000	,, ,,

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The Finest Steaming and Bunker Coals of the Far East are mined from the famed Miike, Tagawa, Yamano Sunakawa and Kawakami Collieries operated by the

MITSUI

MINING COMPANY, LTD.

HEAD OFFICE:
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TOKYO, JAPAN

Capital - - Yen 100,000,000

Annual Coal Output is equal to one-quarter of Total Japanese Mines.

LEAD, SILVER, GOLD, ZINC, COPPER, SPELTER, SULPHUR, COKE, IRON, CHEMICALS and DYES

Are produced from the Company's, KAMIOKA, Lead, Silver and Zinc Mine; SANO, Copper and Zinc Mine; KUSHIKINO, Gold Mine; KONGO, Tungsten Mine; IWAONOBORI, Sulphur and Metal Mine; Zinc Plants, Coke, Dyestuffs and By-products Establishments in Miike.

Sole Agents for our Products:

MITSUI BUSSAN KAISHA, Ltd.

(MITSUI & Co., Ltd.)

Tokyo, London, New York, Shanghai, Hongkong, and other Principal Commercial Centres of the World.

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SHIPS
MARINE ENGINES
LOCOMOTIVES
MACHINE TOOLS
FORGINGS CASTINGS
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DROP STAMPINGS
HIGH SPEED STEELS
SMALL TOOLS GAUGES
PNEUMATIC TOOLS
ELECTRIC LIGHTING SETS
ROAD MAKING MACHINERY
HYDRAULIC MACHINERY
HYDRO ELECTRIC PLANT
CIVIL ENGINEERING
GENERAL ENGINEERING

Chill Cast Bars & Anti-Friction Metal Ingots

for all types of bearings.

Brochure No. 313 is fully descriptive of our Non-Ferrous products and our facilities for this class of work. Quality is naturally in accordance with Armstrong, Whitworth standard, and deliveries are prompt.

May we quote you?

SIR W. G. ARMSTRONG, WHITWORTH & CO., LTD.

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London Office:
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Telephone: *Victoria 4010 (6 lines).*
Code: *Bentley's.*
Telegrams: *"Zigzag, Parl, London."*

Agents for Japan: Messrs. Samuel Samuel & Co., Ltd., Tokyo Nichi Nichi Shimbun building, Yurakucho—1 Ichome Tokyo, Japan.

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Green Island Cement is supplied in Bags = 250-lbs. net, Casks = 375-lbs. net, Iron Drums = 375-lbs. net.

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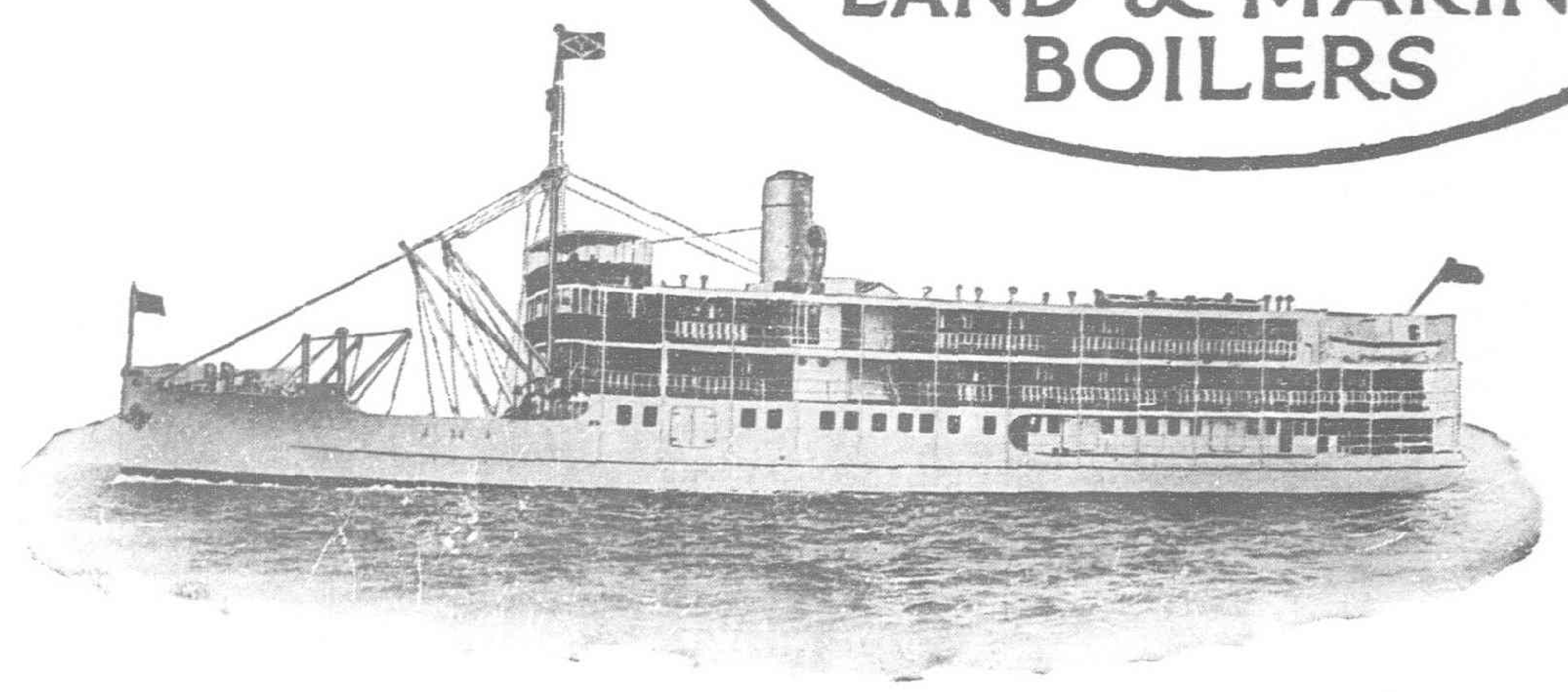

FAIRBANKS
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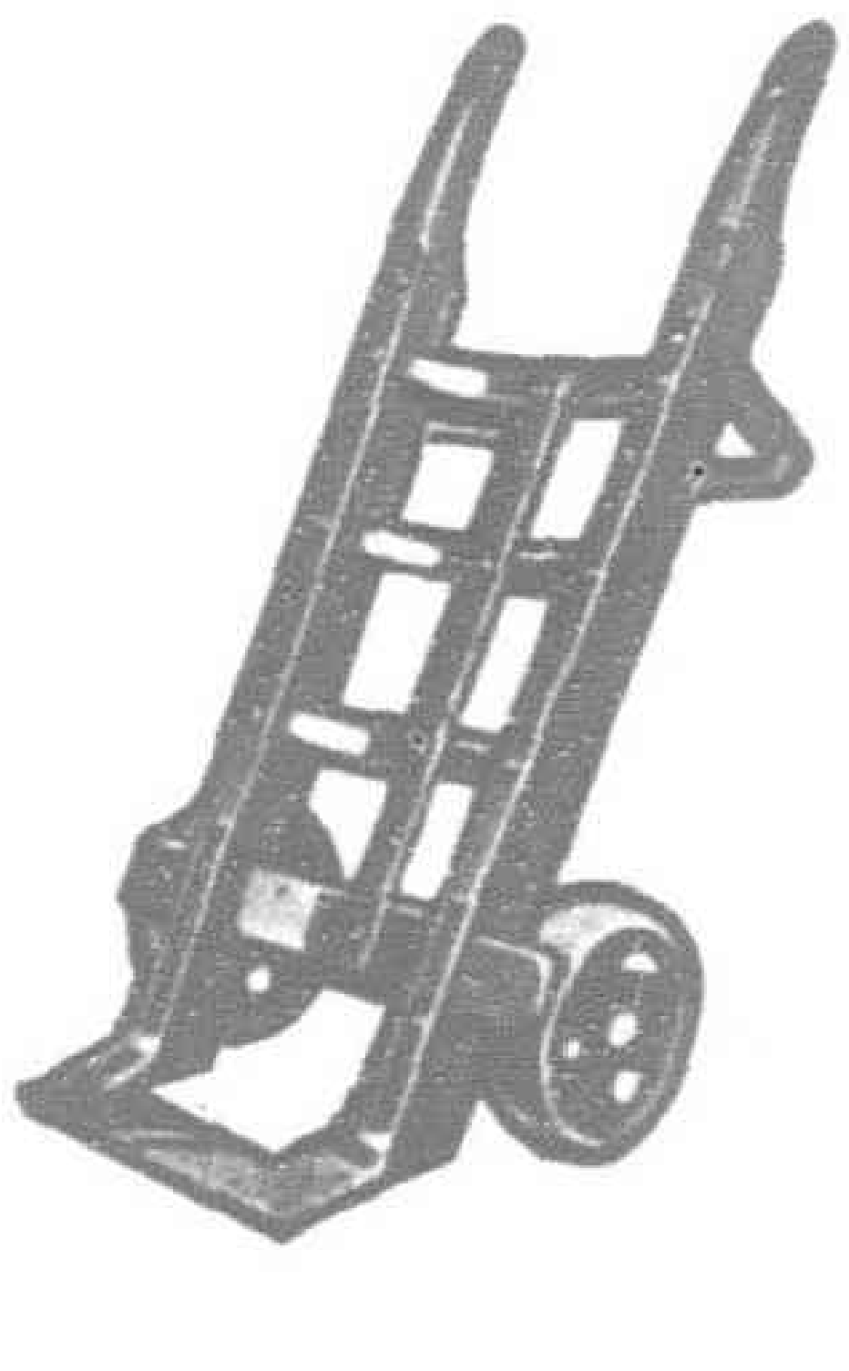

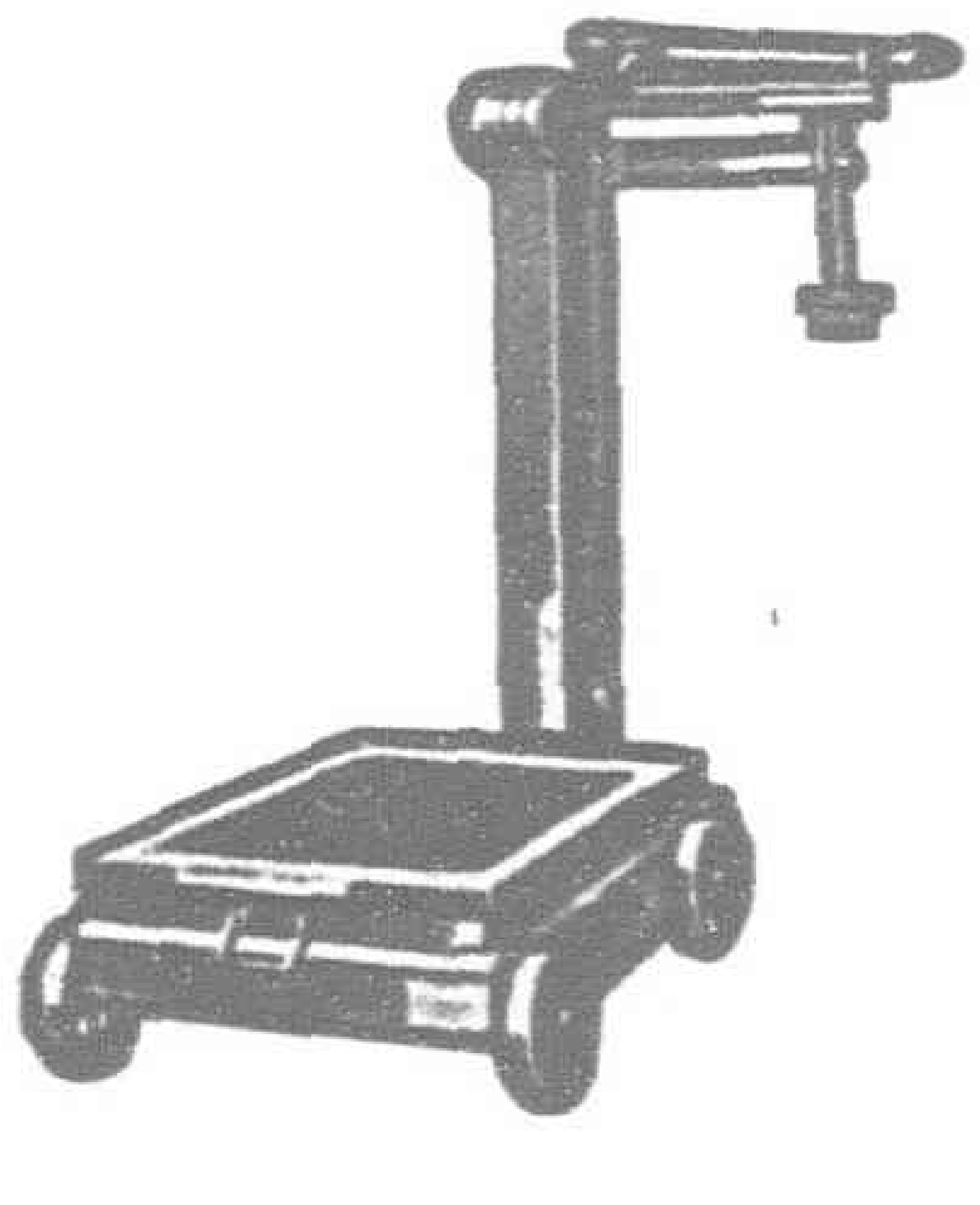

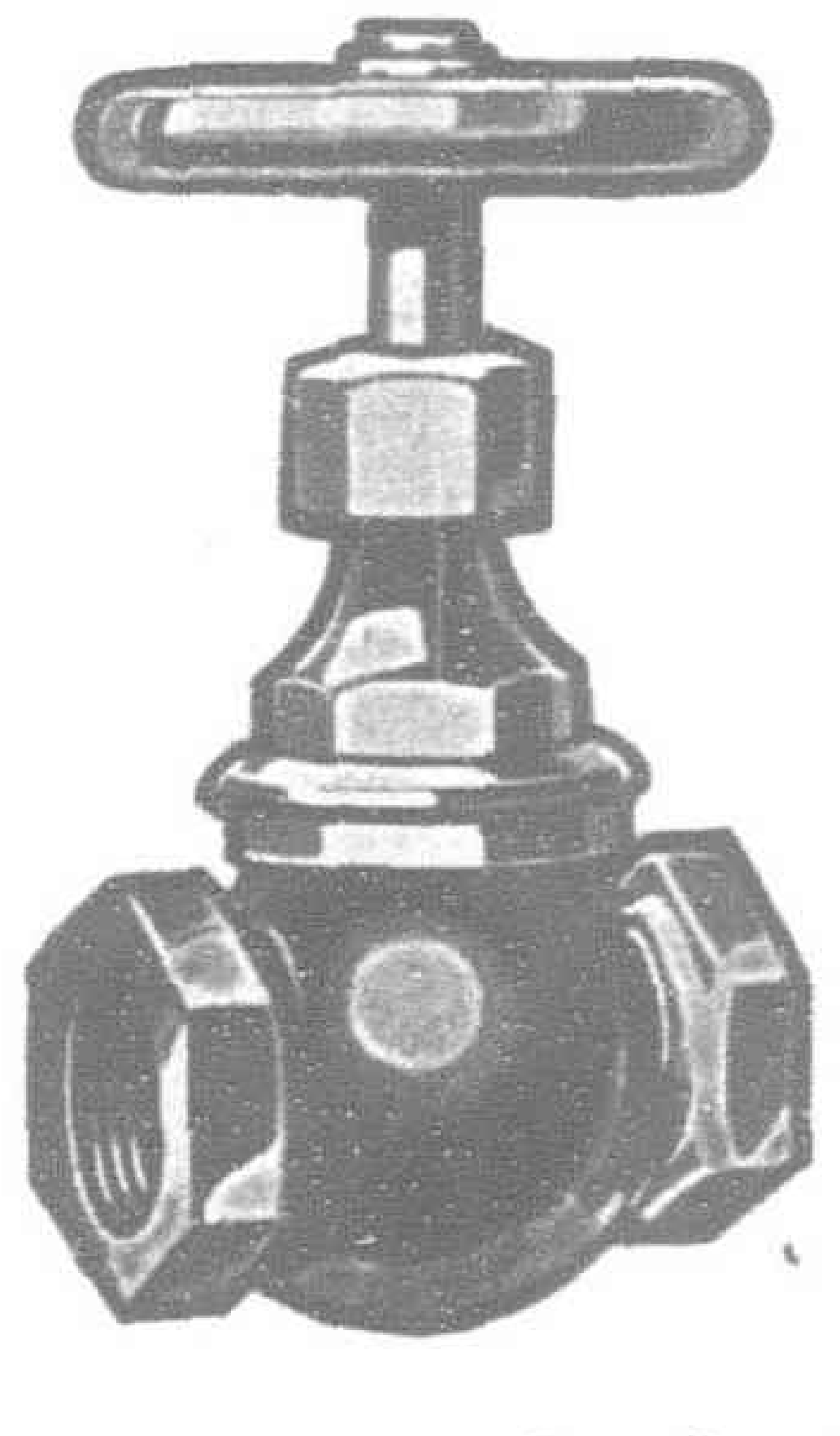

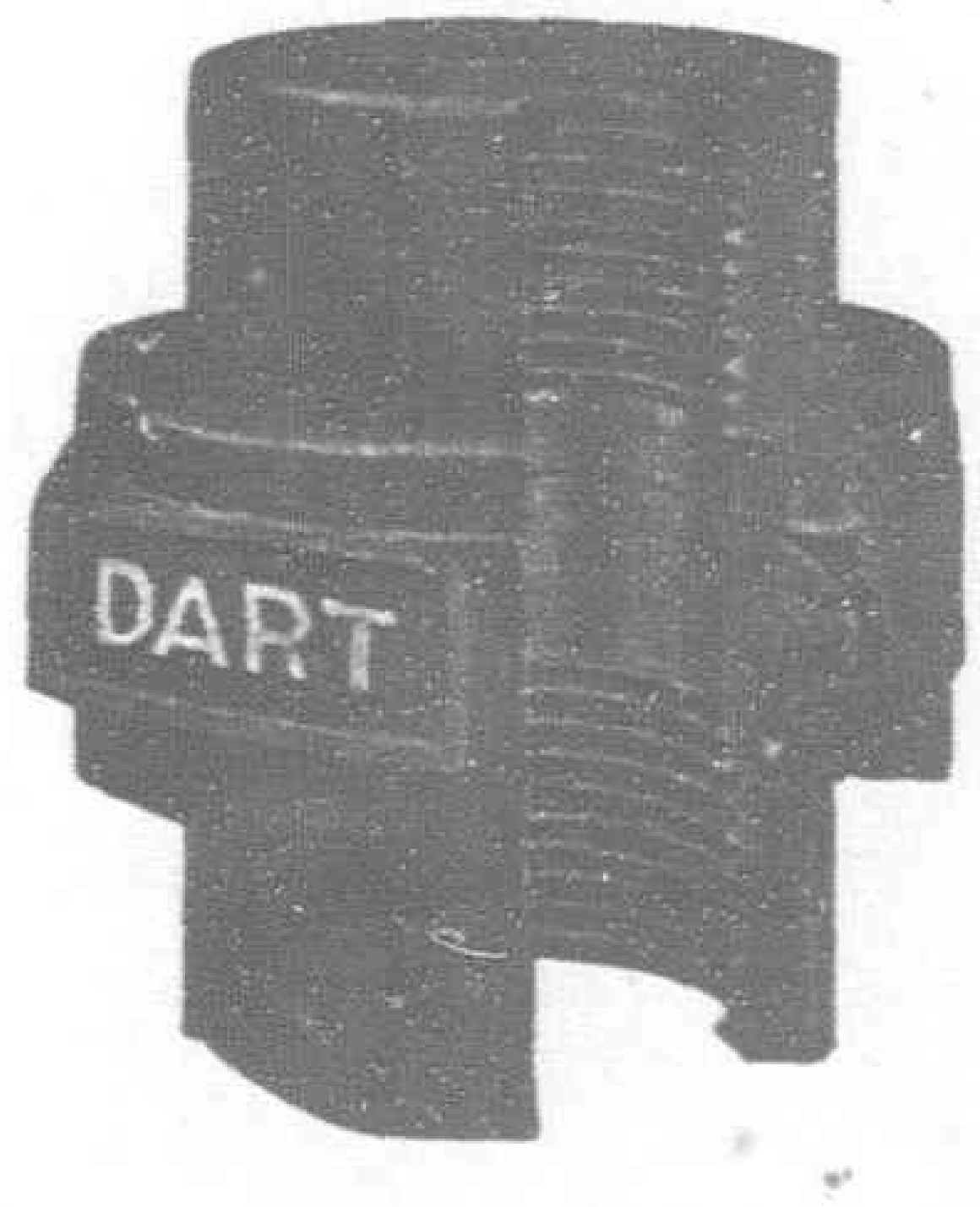

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Nobel Industries Ltd., in addition to exhibiting in the Palace of Industry examples of all their products, have installed machinery in the Nobel Bay to give the public an insight into the manufacture of their products. The machinery includes the assembling of Eley and Kynoch shot-gun cartridge cases, the gauging of Kynoch .303 Service ammunition, electric welding with the Premier Electric Welding Co.'s plant, many operations in the making of "Ironclad" Gas Mantles, the minting of the Nobel commemoration medal on a Kynoch Coining Press and the ubiquitous "Lightning Fastener."

Outside the Palace of Industry will be found other Nobel products—explosives in the Coal Mine and Exhibition Hall, ammunition in the Rifle Ranges, "Pegamoid" and "P-V" Leather Cloth in South Africa where Kynoch Fertilisers, Dips and Disinfectants are also exhibited.

The decoration of the Nobel Bay and certain parts of the Exhibition is carried out with Nobel Metal Powders and Medium.

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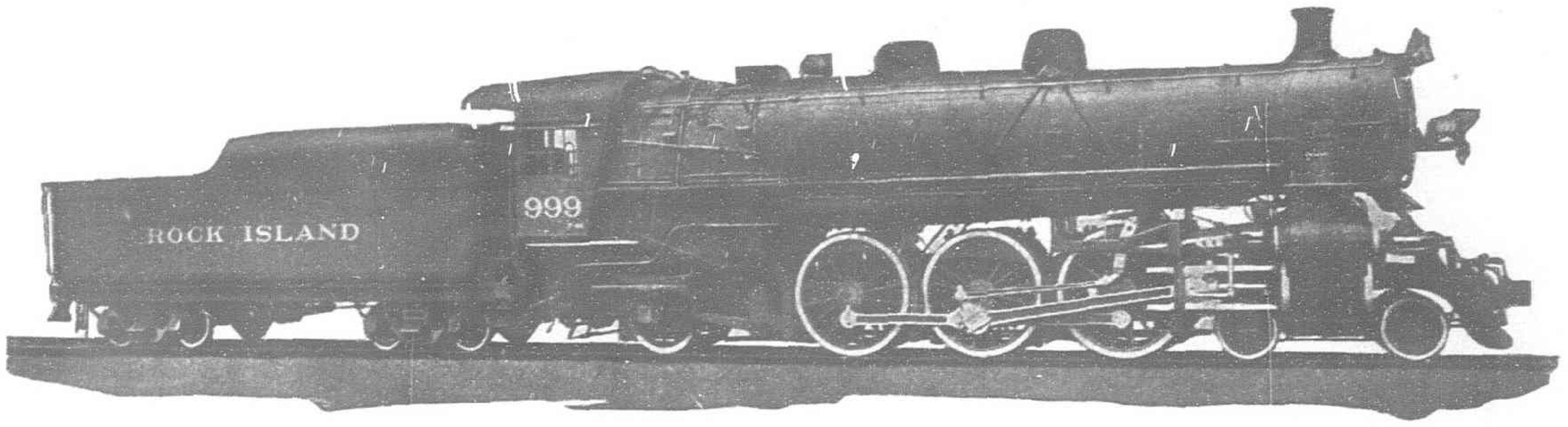

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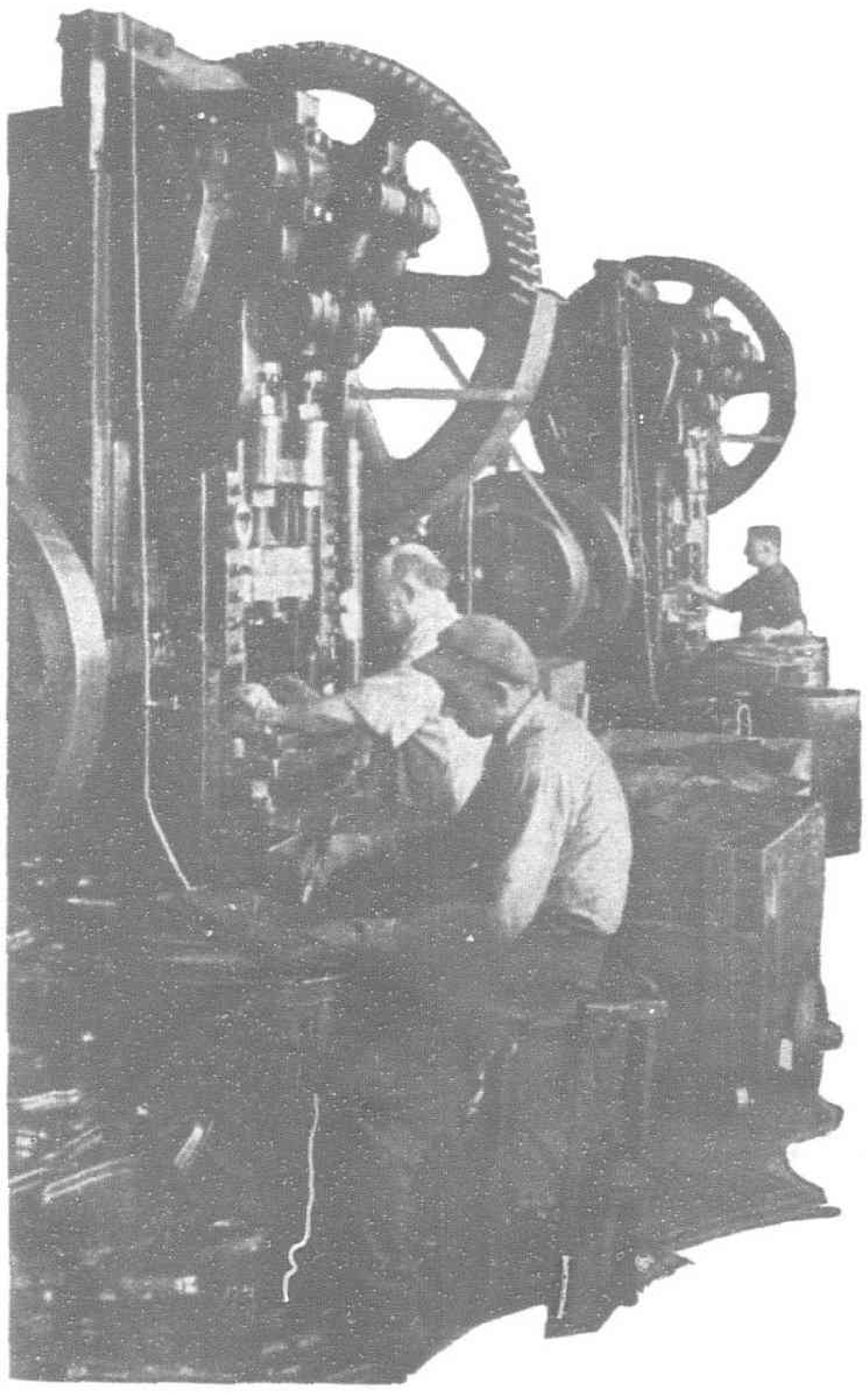

"Bliss" No. 3½B Toggle Drawing Presses, producing steel covers for automobile gears and copper water jackets for automobile motors.

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The name "Bliss" has been associated with the sheet metal working industry since its infancy. Bliss Presses have for years and are today taking an important part in the further development of this industry. The wealth of experience which we have accumulated in 68 years of solving sheet metal problems will aid in solving your problems.

We are prepared to furnish equipment for the economical production of any article made of sheet metal, regardless of its size or shape.

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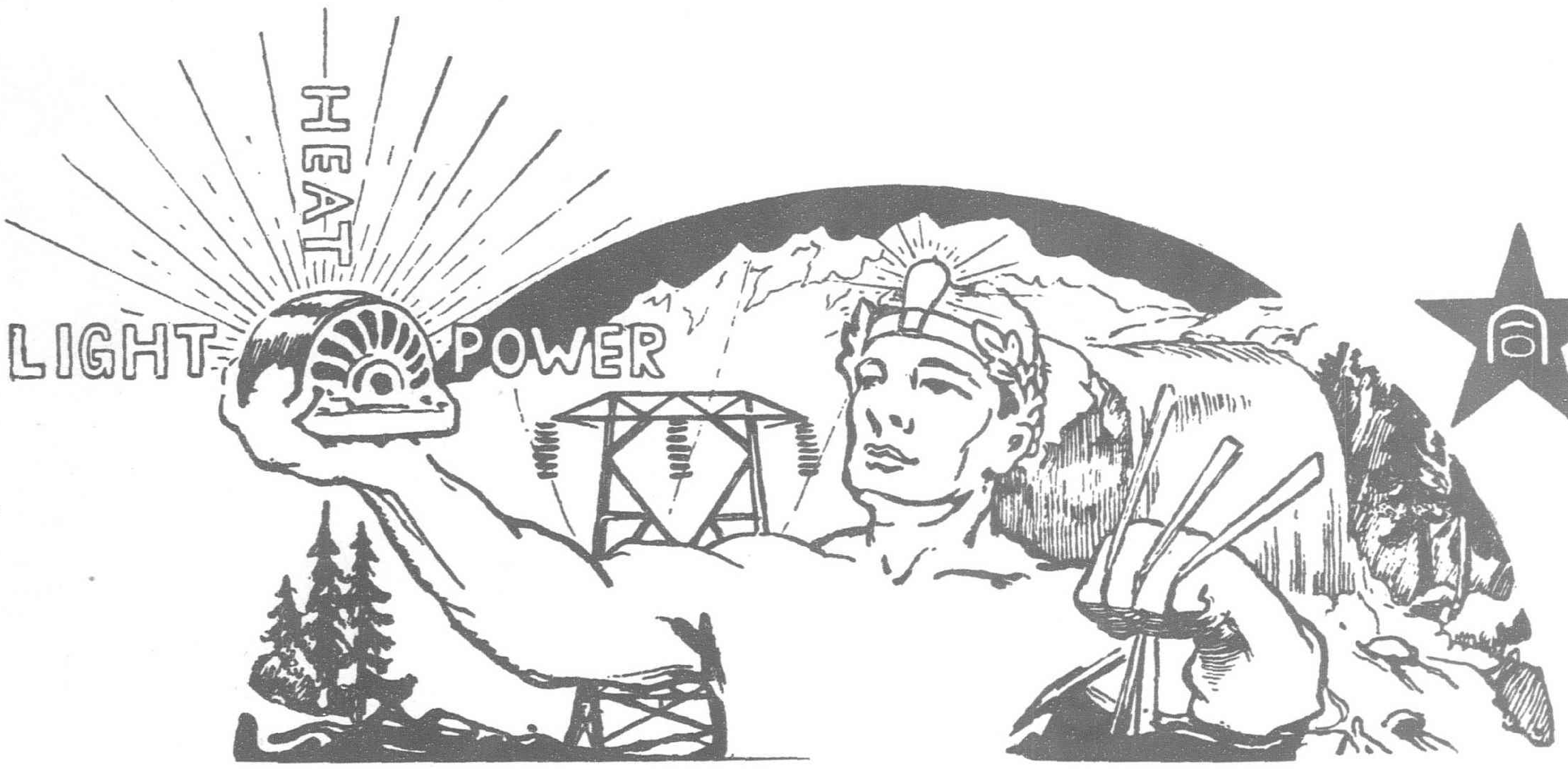

The Forces of Nature Are the People's Servants

Through long centuries men lived on the banks of mountain streams, hunting wild beasts and tilling the soil for a livelihood, all unsuspecting the presence of a miraculous power that lay concealed within the sparkling water. The precious secret of employing that hidden power for the greater happiness of mankind was yet to be discovered.

But at last the idea of hydro-electricity was born. The world's rivers assumed a new importance, and from that day industry has been surging forward at an unprecedented pace.

To-day Japan's natural water-power resources are the foundation of an industrial structure of which the ultimate strength and scope may now be only imagined. And the corner-stone of the foundation—the leader among all the hydro-electric enterprises of Japan, is the Daido Denryoku Kabushiki Kaisha.

The Daido organization, with its six enormous power units on the Kiso River (in the Japanese Alps) has pointed the way for all future hydro-electric development in this country. Its plants are the most extensive and its power capacity the greatest in the Eastern Hemisphere. And by all who know industrial conditions in Japan, it is recognized not only as a modern and efficient business organization, but a guiding star for the forward movement of industrial organizations in the East.

The territory served by Daido comprises Japan's principal industrial districts, with a total population of 20,000,000 and constantly increasing needs for electric power.

The $15,000,000 bond issue successfully floated by Daido in New York August 1, 1924, was the first private Japanese industrial loan to be offered in the American market.

Water Power Generated by Daido

	Kilowatt
Kisogawa Shizumo Power Station ...	14,700
„ Yomigaki „ „ ...	40,700
„ Oi „ „ ...	42,900
„ Okuwa „ „ ...	11,000
„ Suhara „ „ ...	9,200
„ Momoyama „ „ ...	23,100
Yahagigawa Kushihara Power Station	6,000
Kuzuryugawa Nishi Kadohara Power Station	7,200
Total (Kilowatt)	154,800

Steam Power Generated by Daido

	Kilowatt
Kema Power Station	12,500
Ajikawa East Power Station ...	18,000
Kasugade No. 1 Power Station ...	30,000
Kasugade No. 2 „ „ ...	40,000
Total (Kilowatt)	100,500

Power Received from Other Sources

	Kilowatt
Bisan Electric Power—Asahi Station.	1,300
Bisan Electric Power—Tokise Station	6,000
Kisogawa Denryoku—First and Second Station	2,700
Chuo Electric—Otani Station ...	6,000
Kamioka Water Power—Atotsugawa First Station	7,200
Total (Kilowatt)	23,200

CAPITAL AUTHORIZED, Y112,963,000—TOTAL POWER GENERATING CAPACITY, 255,300 KILOWATT

DAIDO DENRYOKU KABUSHIKI KAISHA

(Great Consolidated Electric Power Co., Ltd.)

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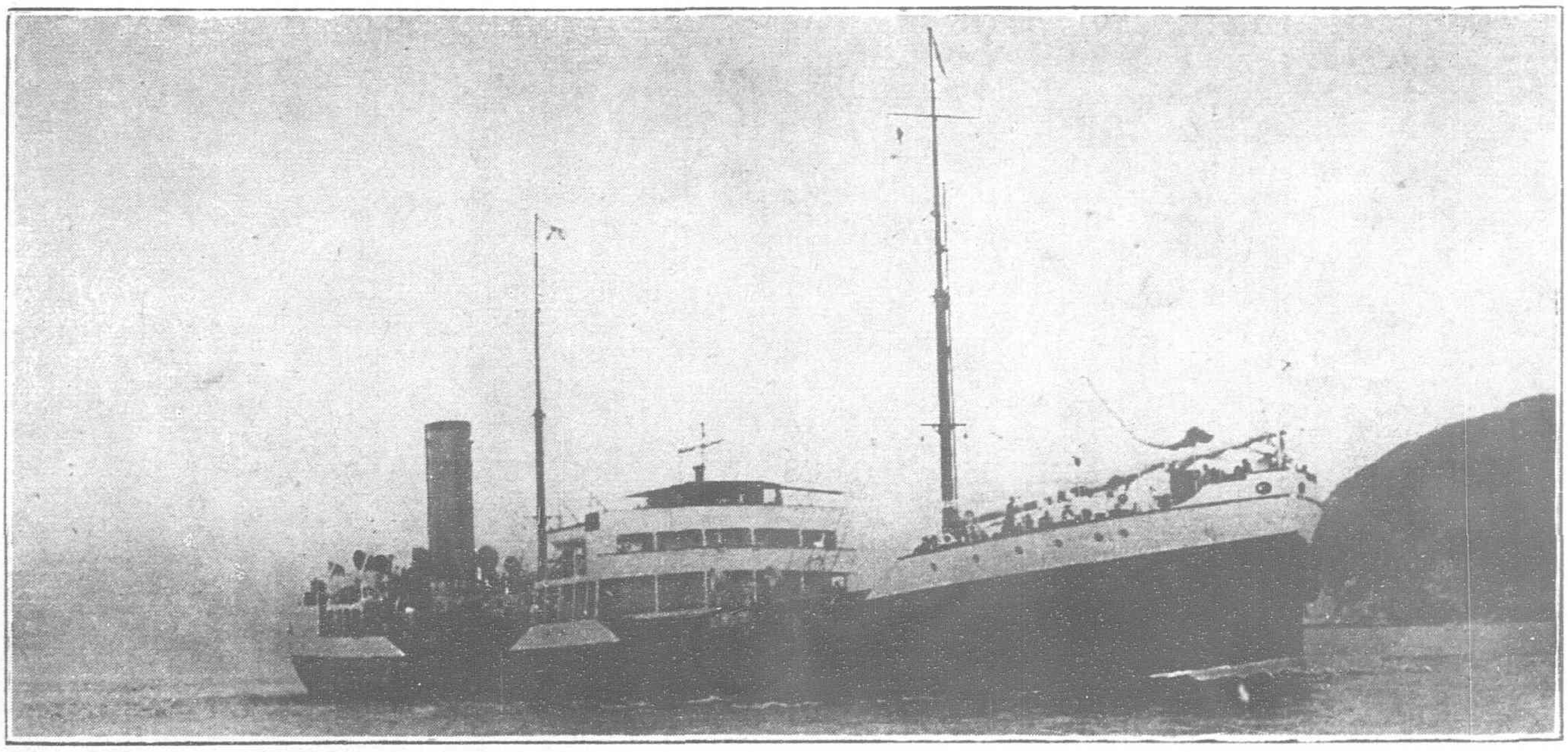

Oil Tank Steamer *PALUDINA*, 427-ft. 0-in. by 53-ft. 1-in. by 31-ft. 0-in. by 8,400 tons d.w. by 3,100 H.P. Built by THE HONGKONG & WHAMPOA DOCK CO., LTD. at KOWLOON DOCKS to the order of THE ANGLO-SAXON PETROLEUM CO., LTD., being one of four similar vessels built in these Works to the same order.

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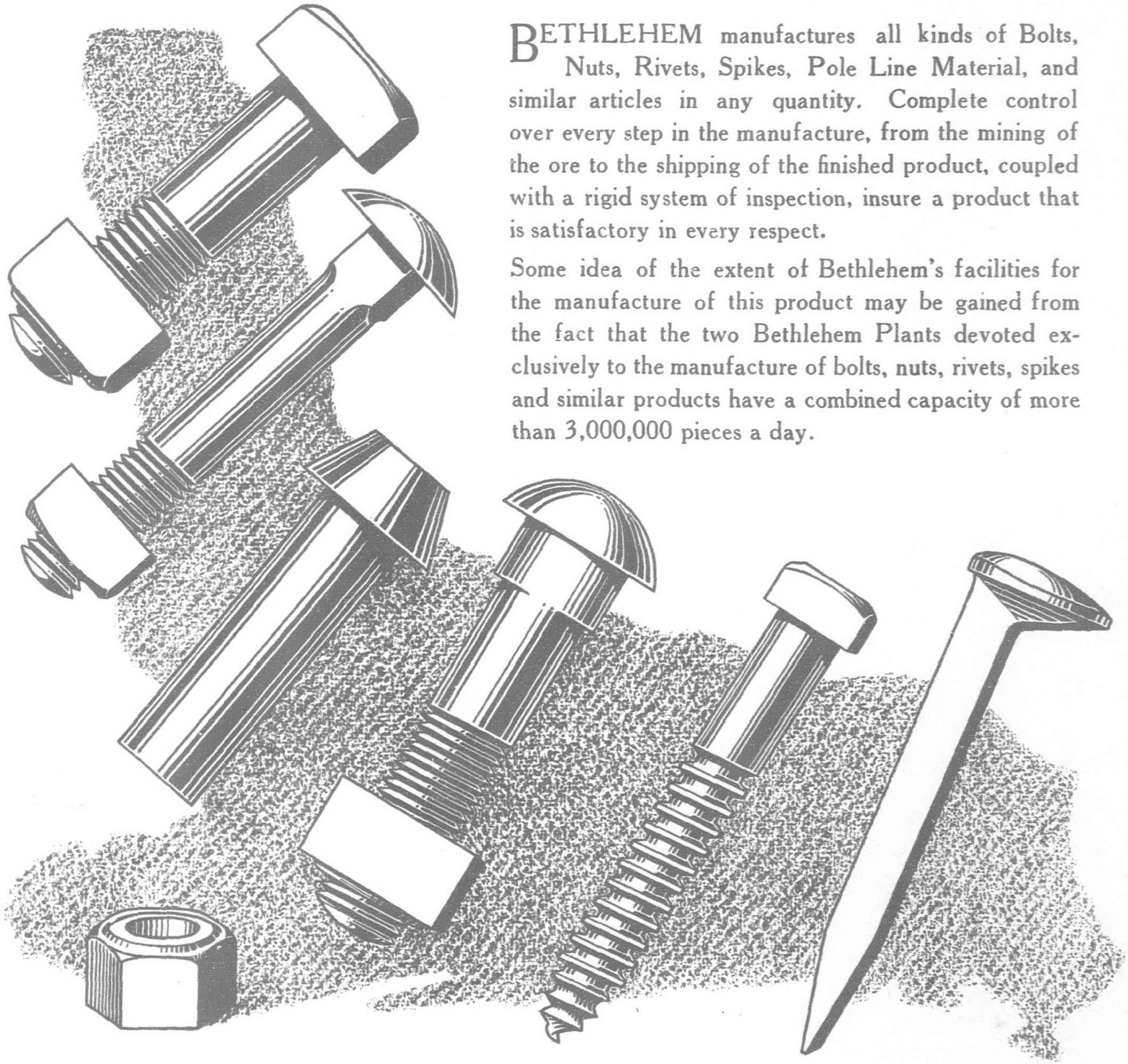
Bolts Nuts Rivets Spikes



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Boilermakers, Dock Proprietors, Shipbuilders, Engineers and Electricians

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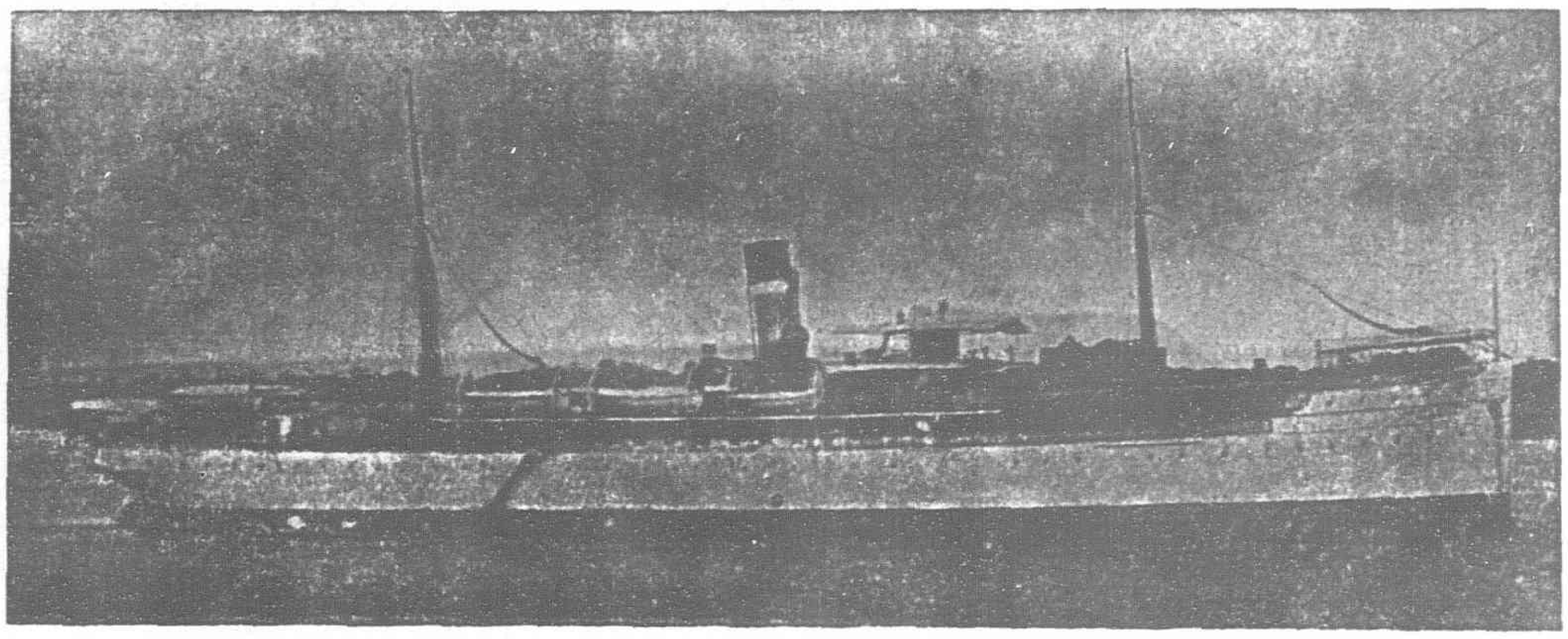
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The "Merritt" is one of Twenty-Seven Steam Vessels built during the last few years to the order of The American Government for service in the Philippine Islands.

The Docks are four in number, ranging in length from 355 feet to 700 feet on the Blocks, and breadth of entrance from 53 feet to 80 feet, with a depth of water on the sill of from 16 feet to 27 feet.

The Dock charges are the most moderate in the Far East.

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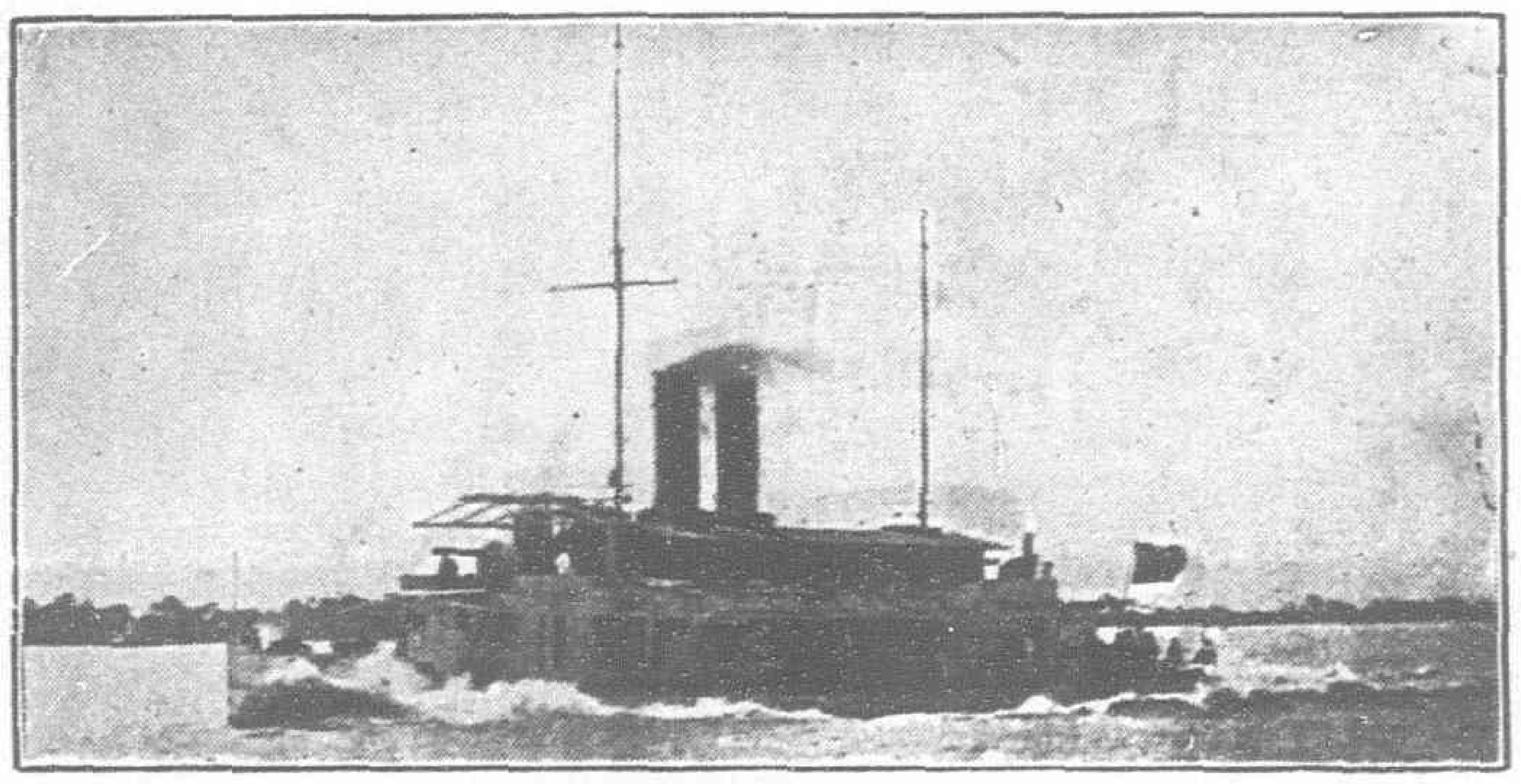
International Dock ...	528 ,,	77 ,,	23 ,,
Old Dock	399 ,,	53 ,,	16 ,,
Tunkadoo Dock ...	350 ,,	67 ,,	16 ,,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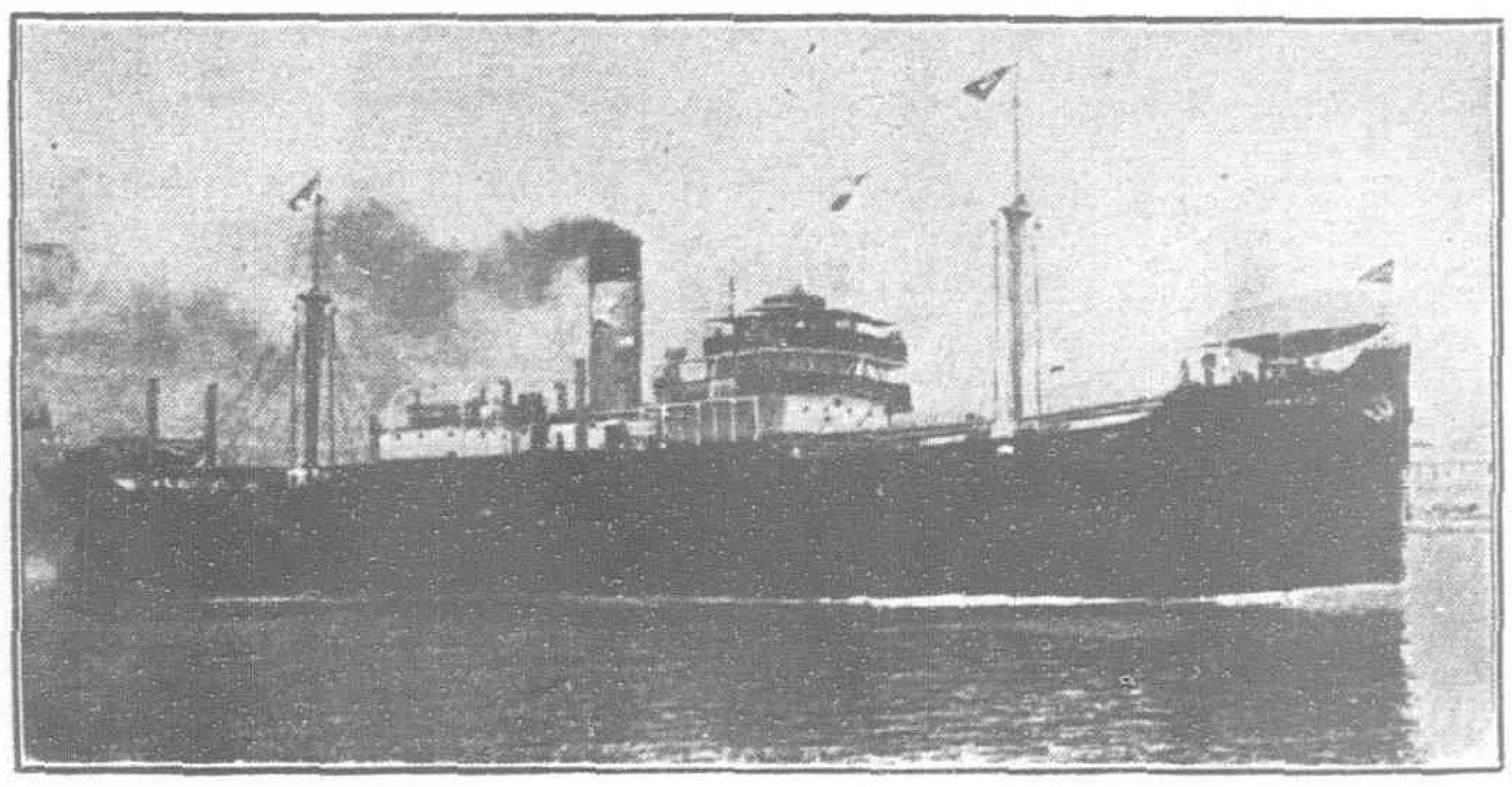
Length 160 feet. Twin Screw Engines.
Draft 2 feet 10 inches with full equipment and 30 tons of coal on board. Mean continuous speed 14 knots per hour.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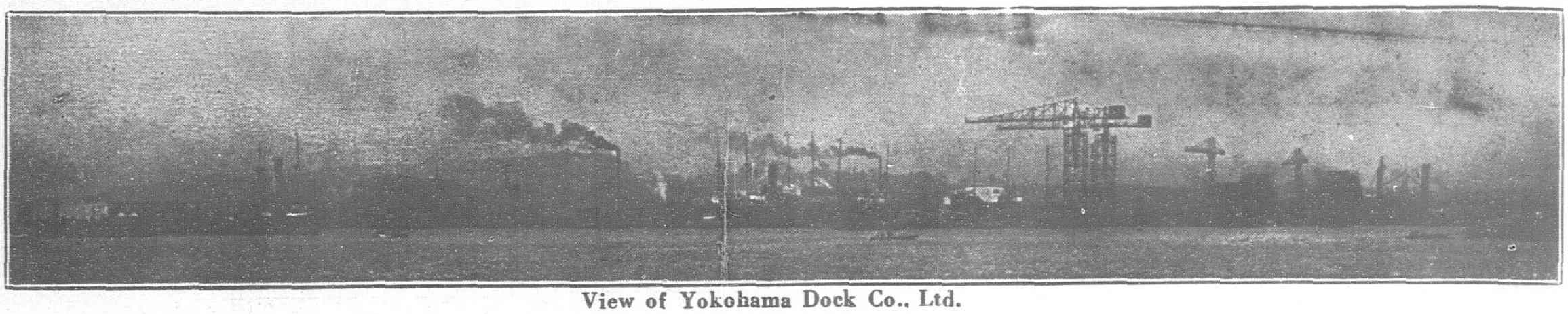

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No. 3	480′ × 63′ × 21½′

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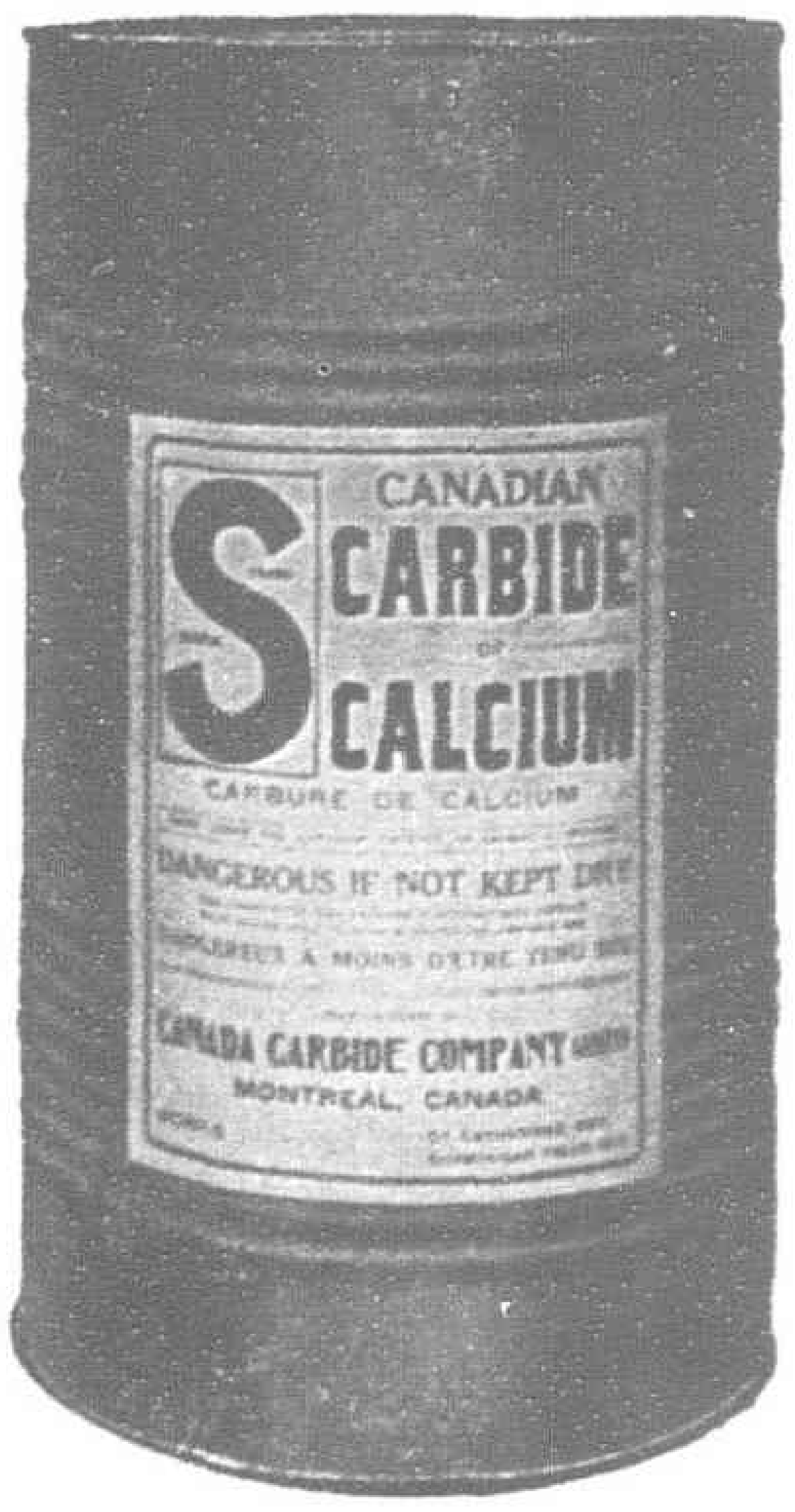

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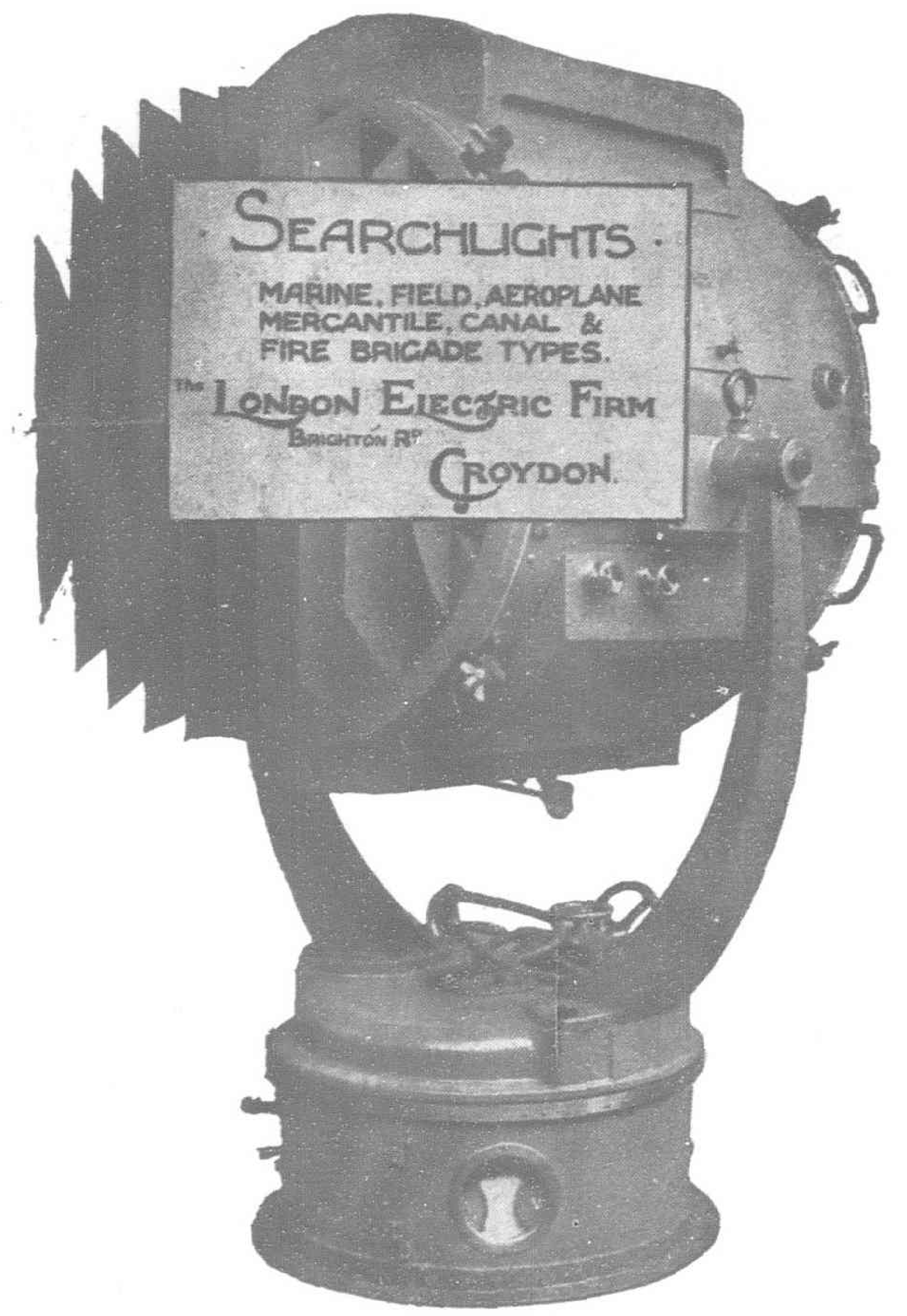

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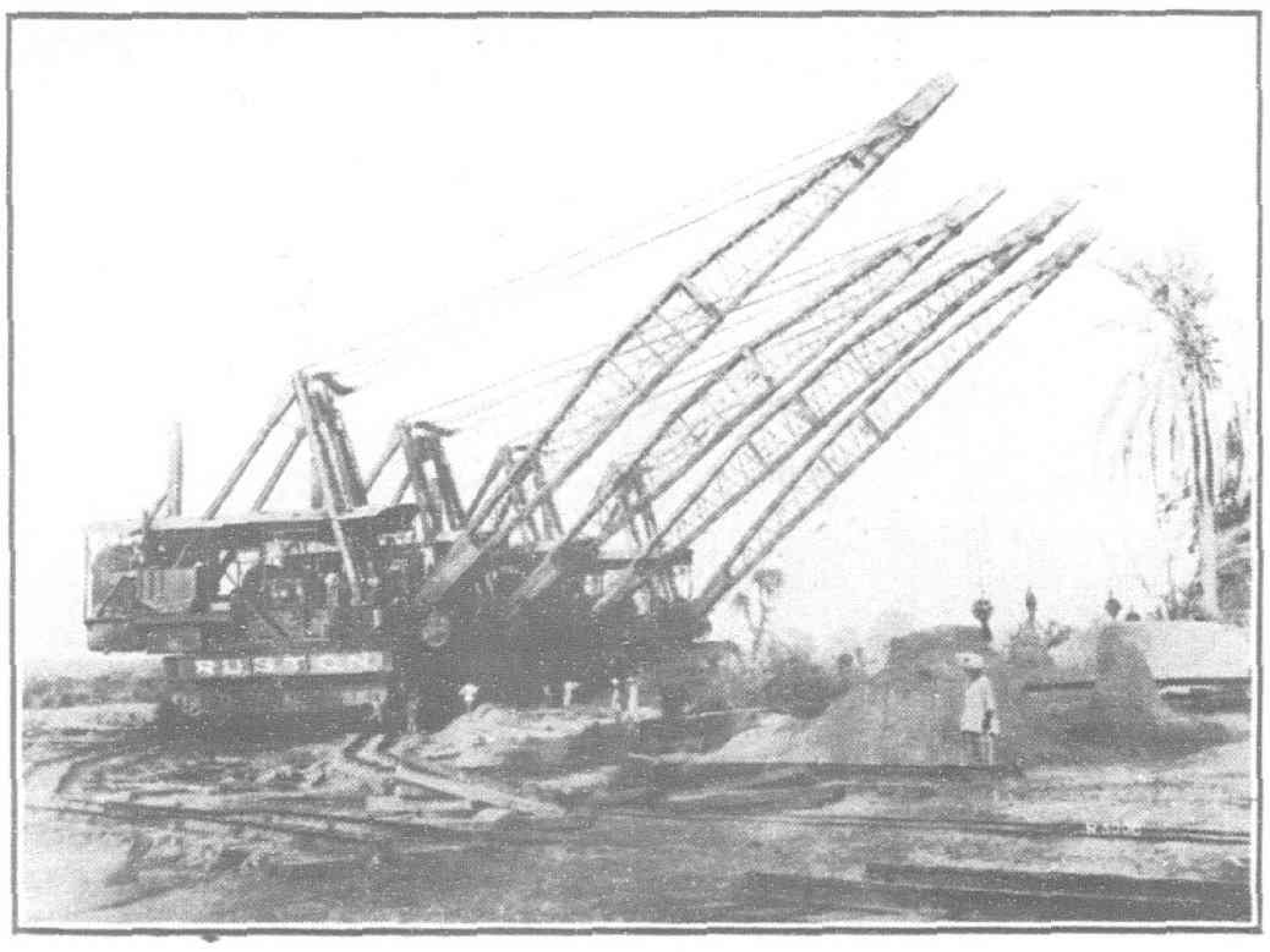

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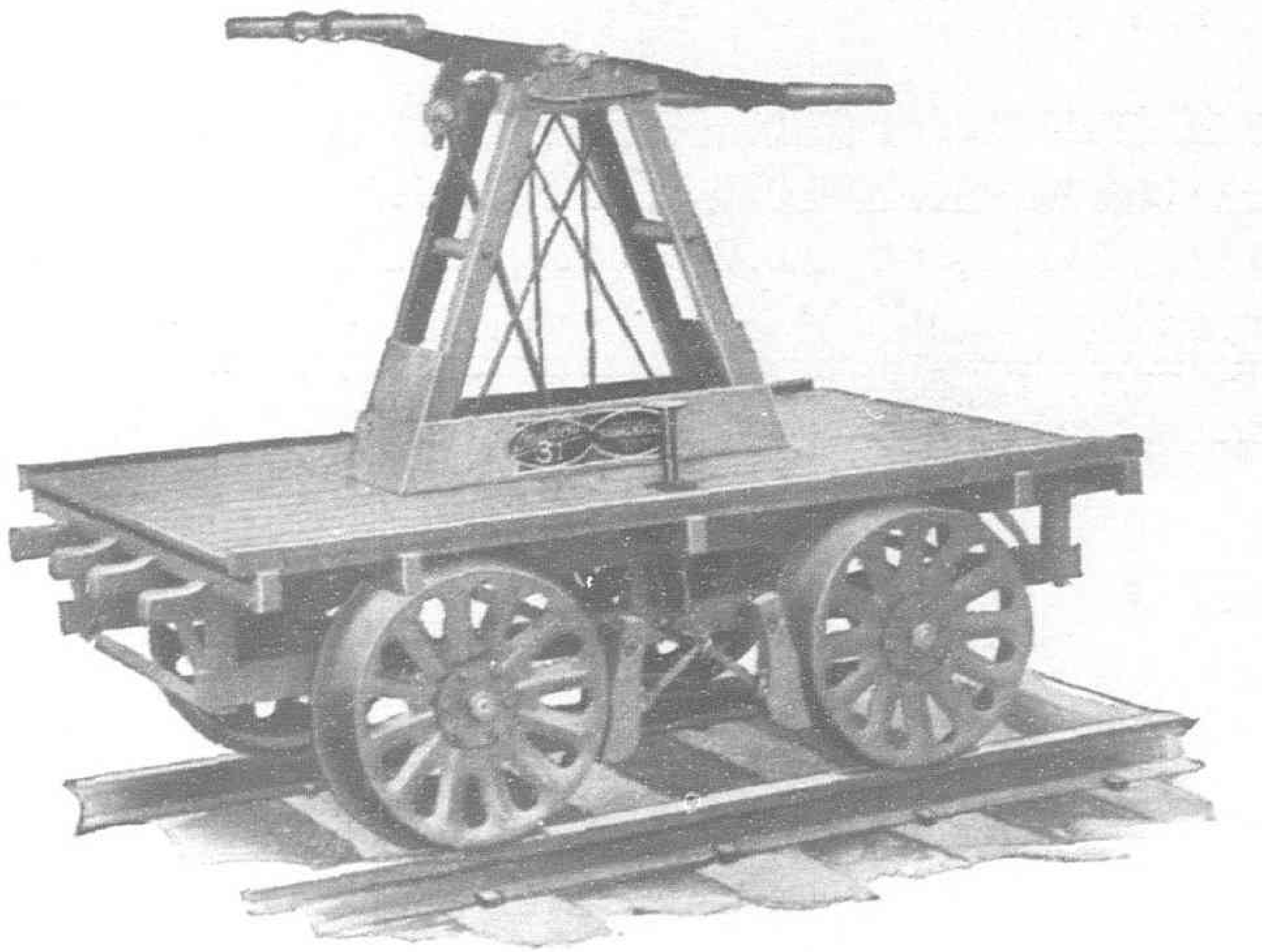

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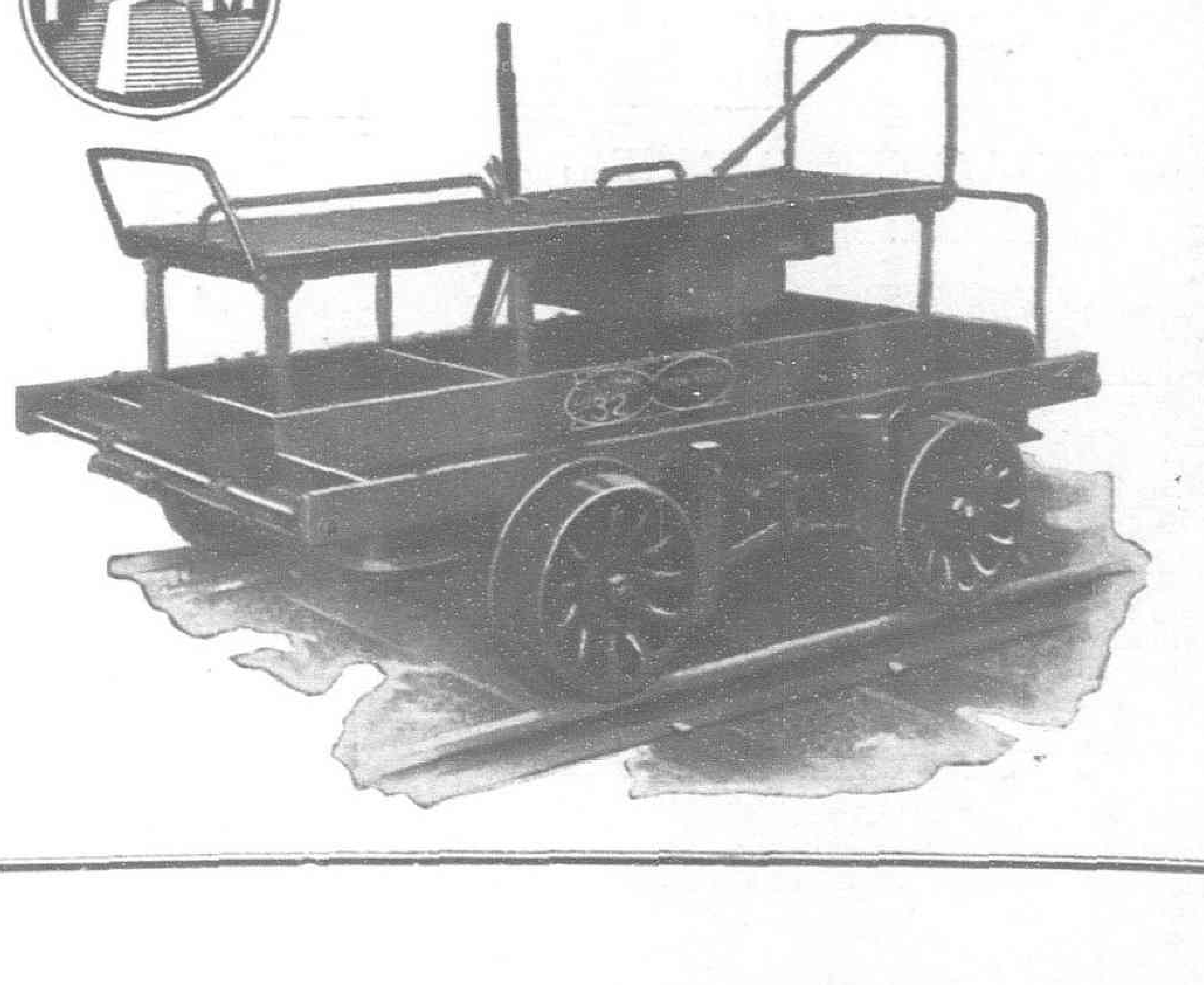

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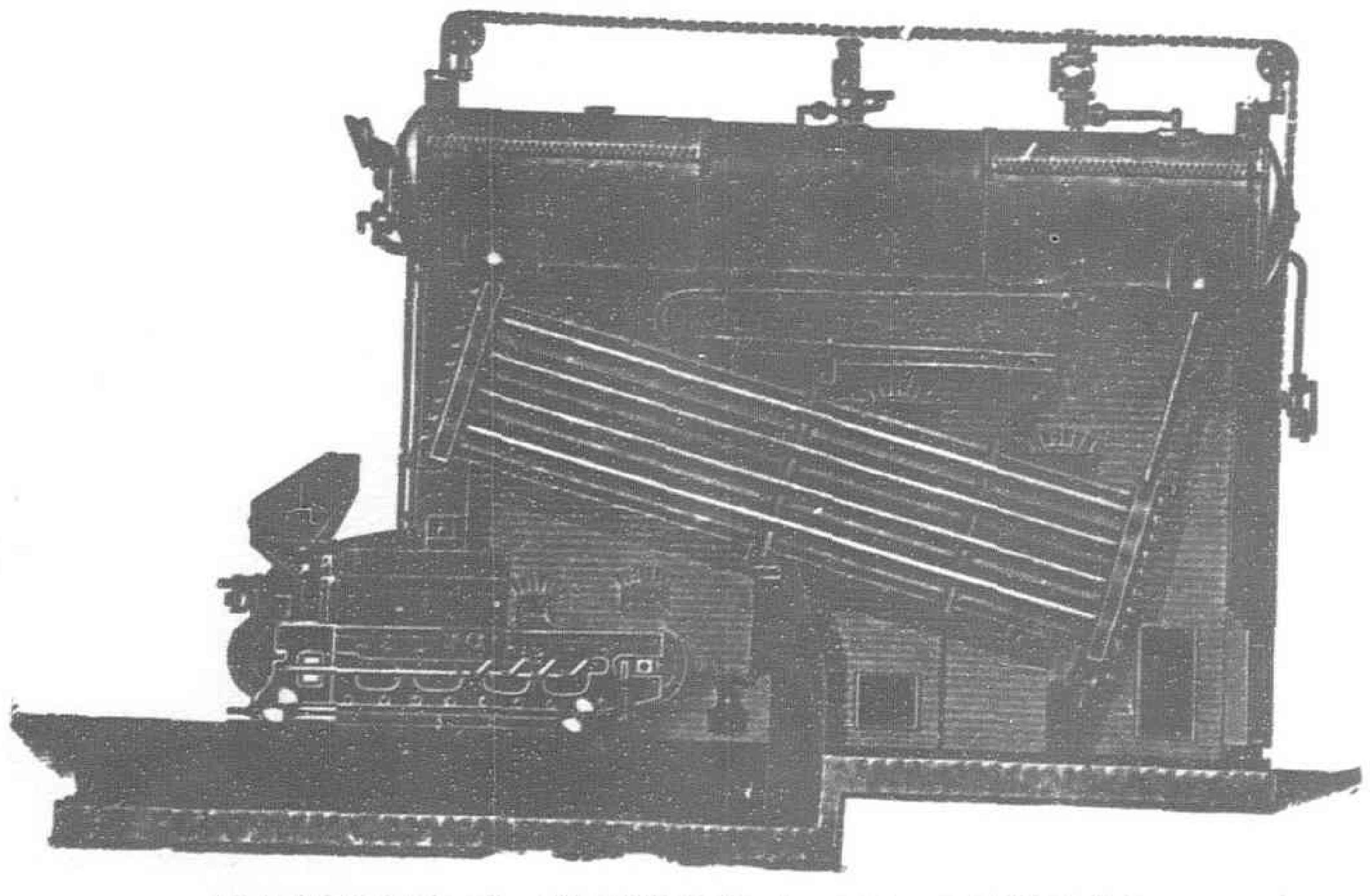

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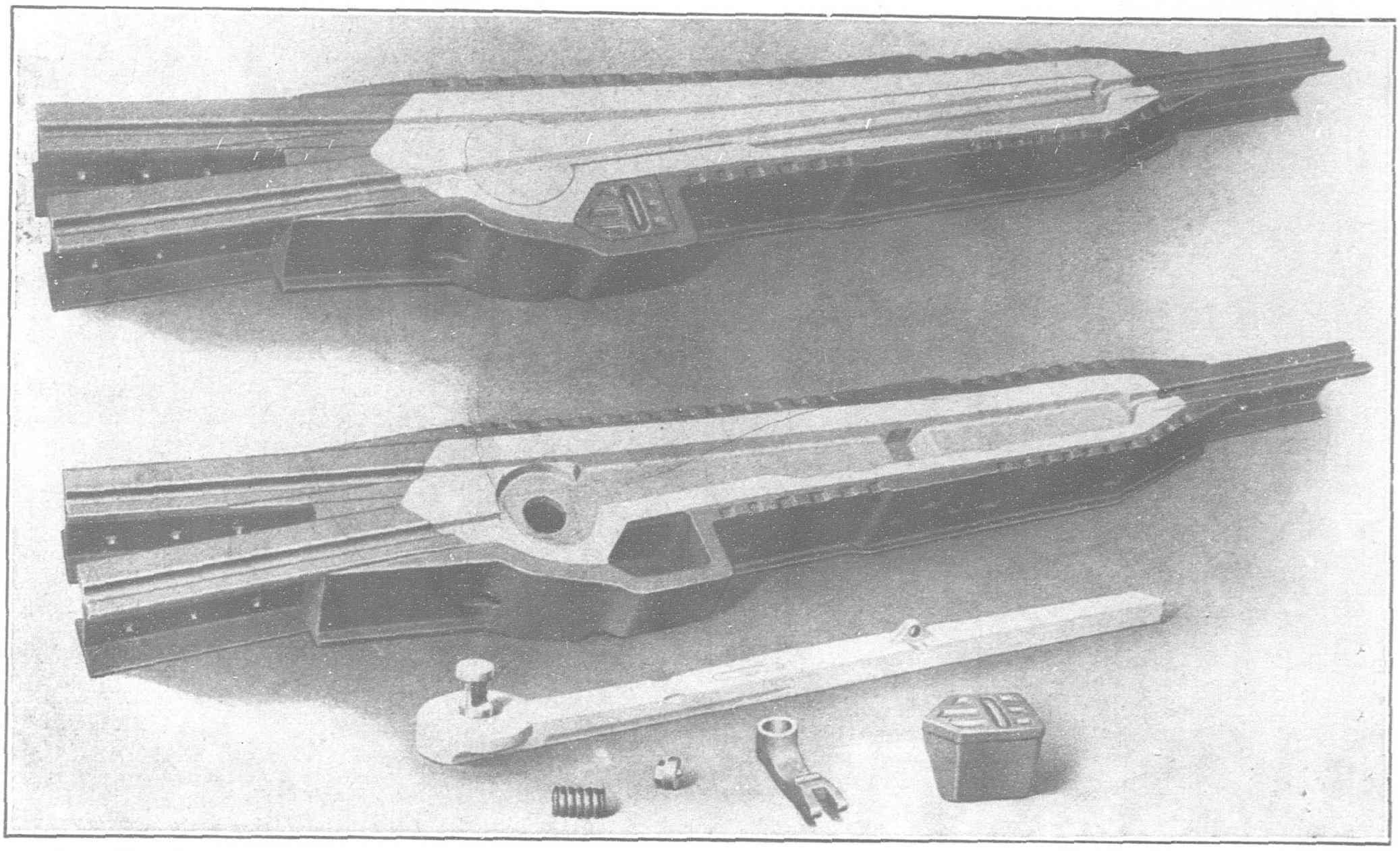
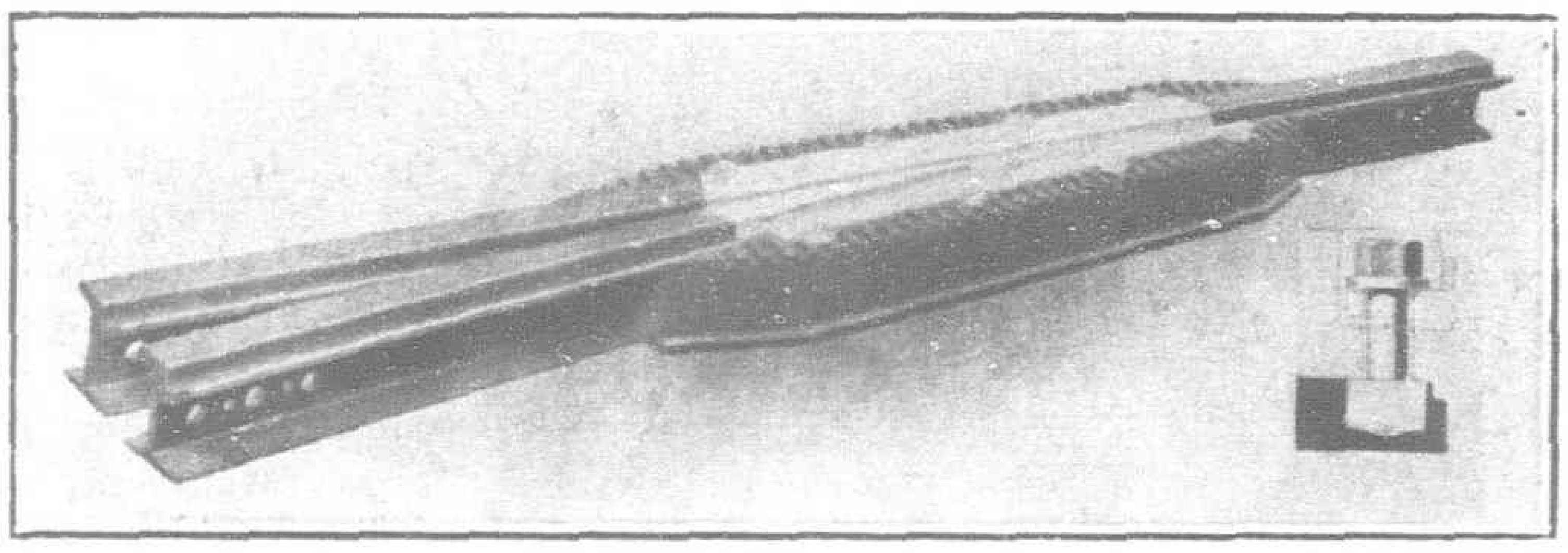
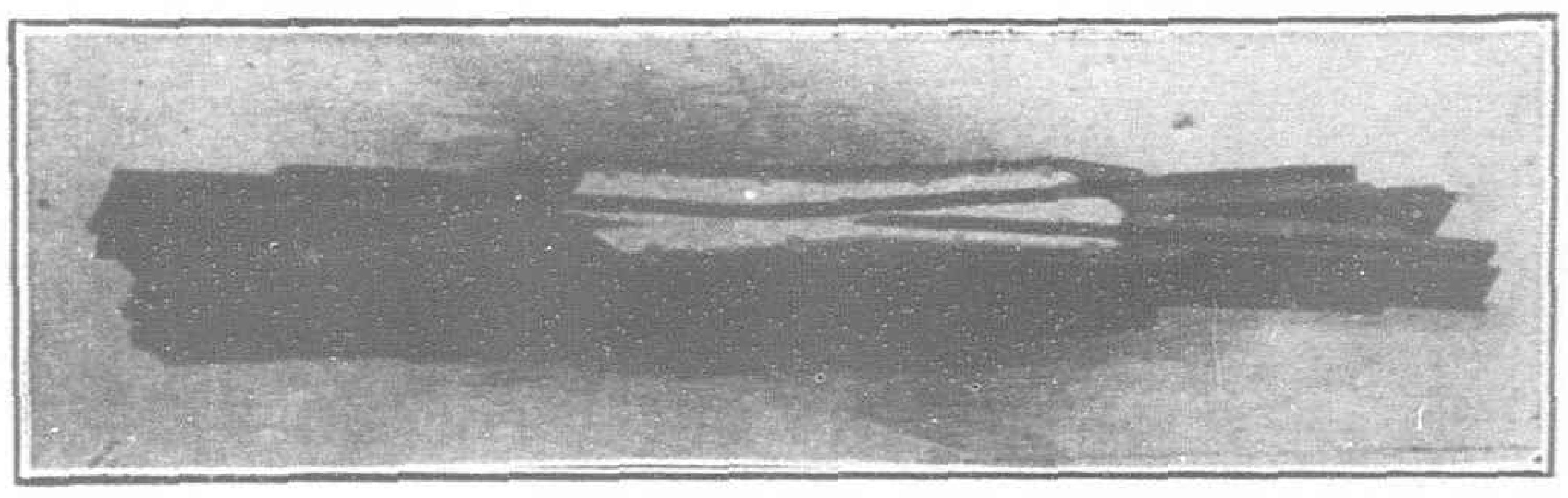


Iron Bound Guarantee Tadpole Tongue Switch. Made of Rolled Steel Rails cast fast in a semi-steel box. Wearing plate and tongue Manganese Steel Construction.



Iron Bound Guarantee Mate—with bolted machined-bearing renewable Manganese Plate.



Iron Bound Guarantee Frog—with bolted machined-bearing renewable Manganese Plate.

Our Iron Bound Guarantee Mates and Frogs are made with external arms of Rolled Steel Girder Groove rails, firmly secured in the main structure, which is of semi-steel. The bolts are of Heat Treated Chromium Steel, having an elastic limit of not less than 10 ,000 pounds per square inch, and are sealed with a material which can be chipped away if it becomes necessary to renew the plate. The nuts are sealed with asphaltum for the purpose of excluding moisture. Tongue Switches, Mates and Frogs also furnished in Solid Manganese Steel Construction,

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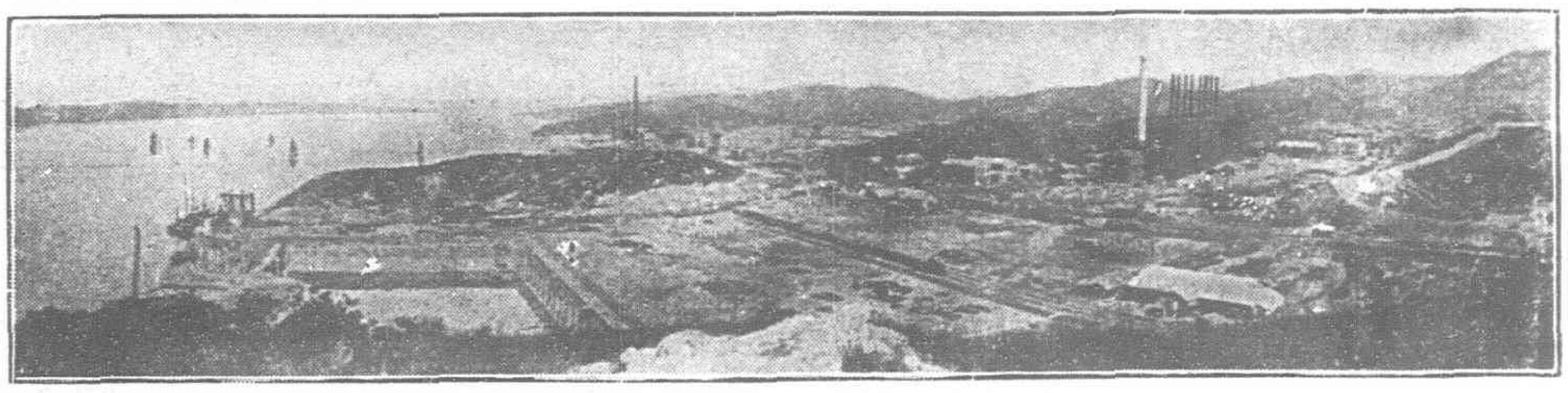

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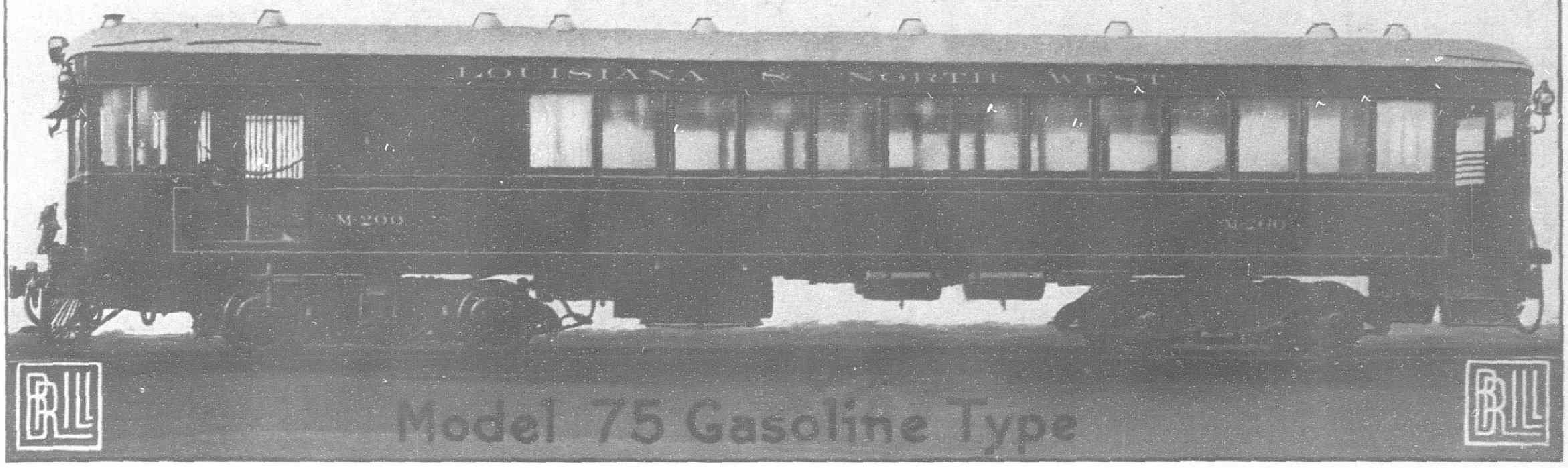

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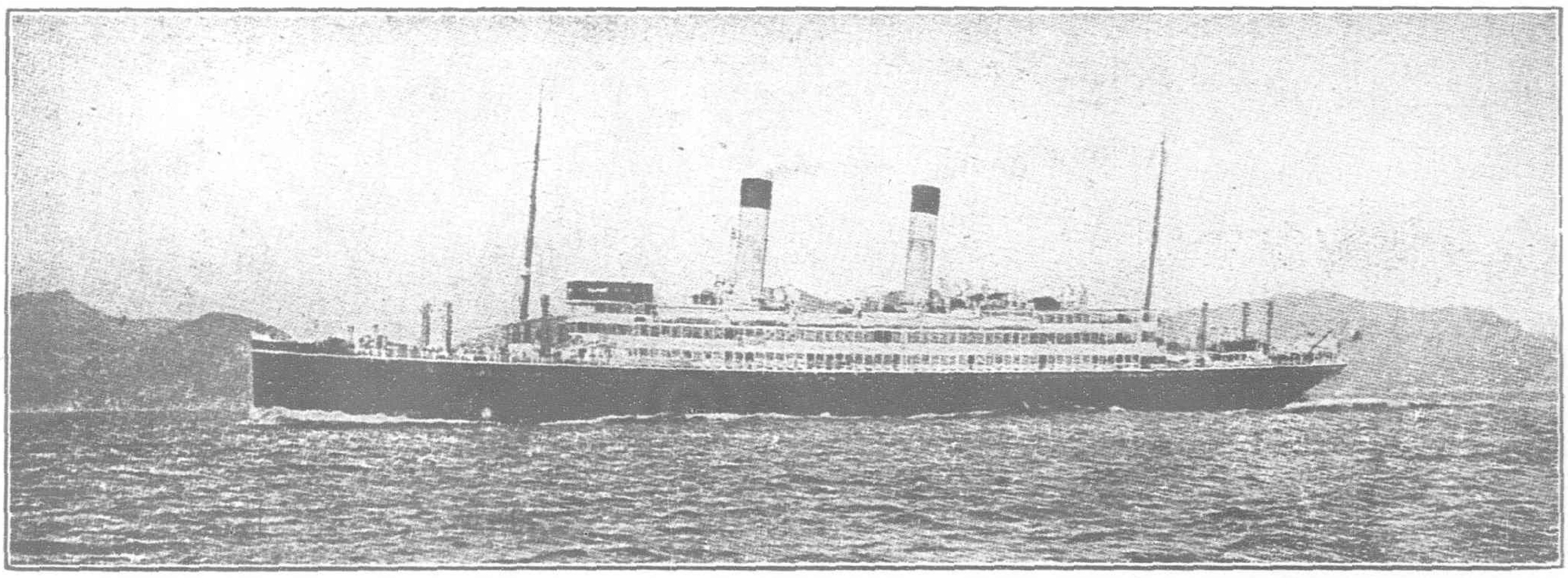

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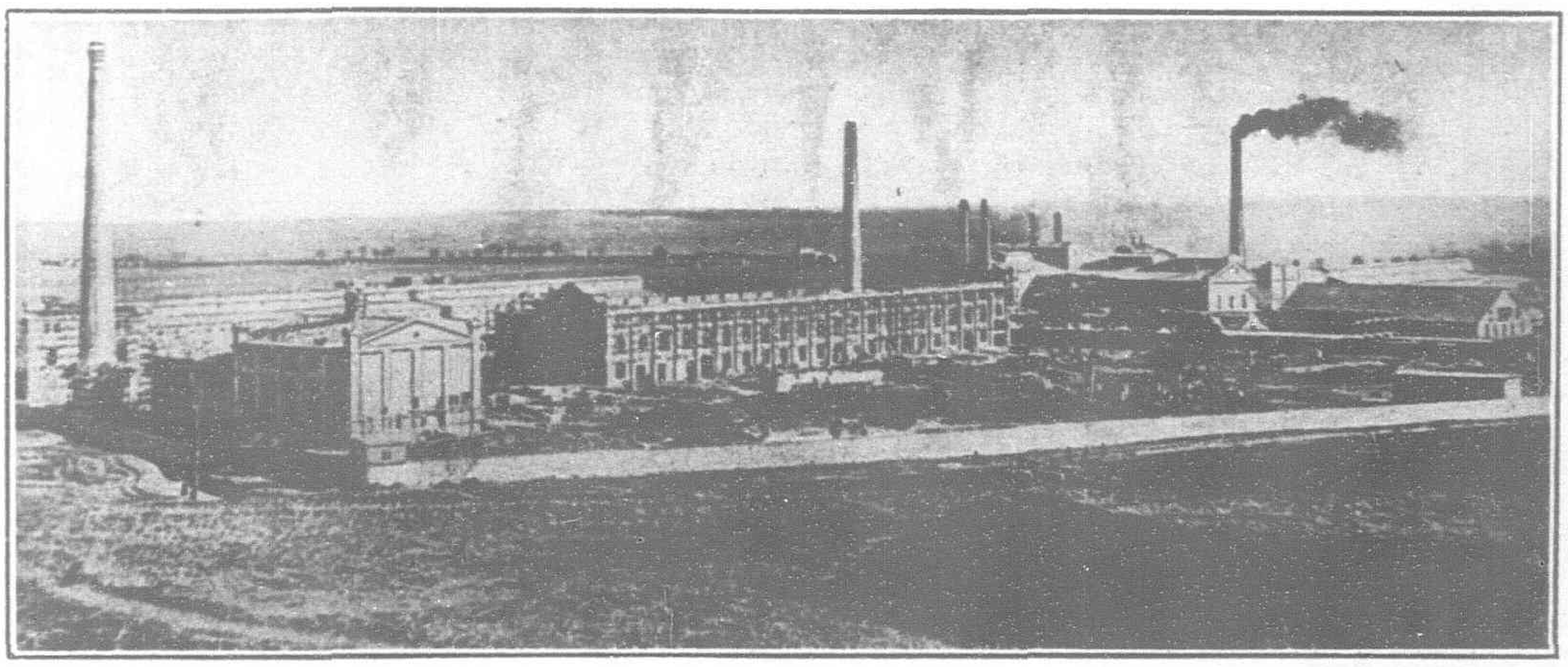

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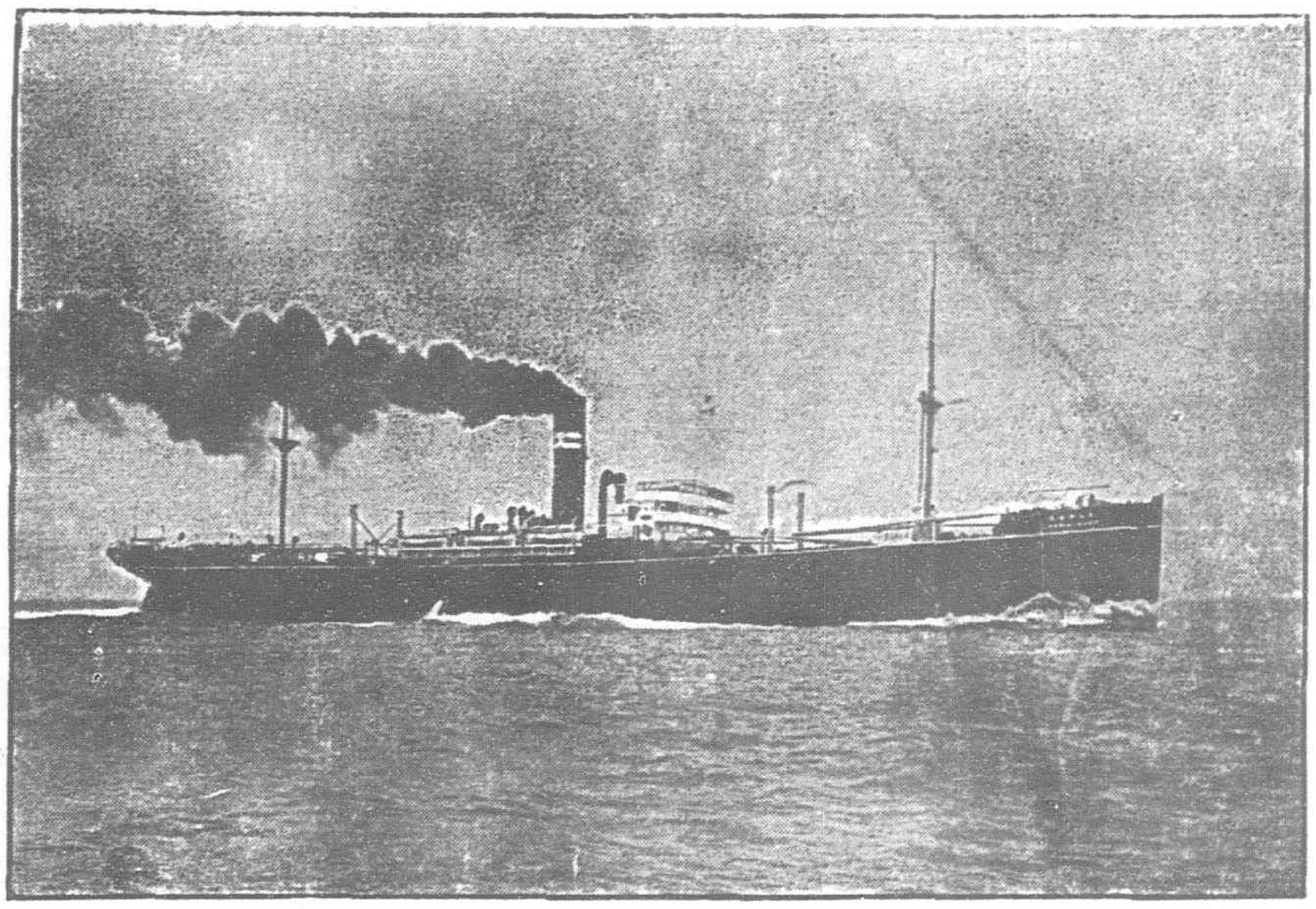

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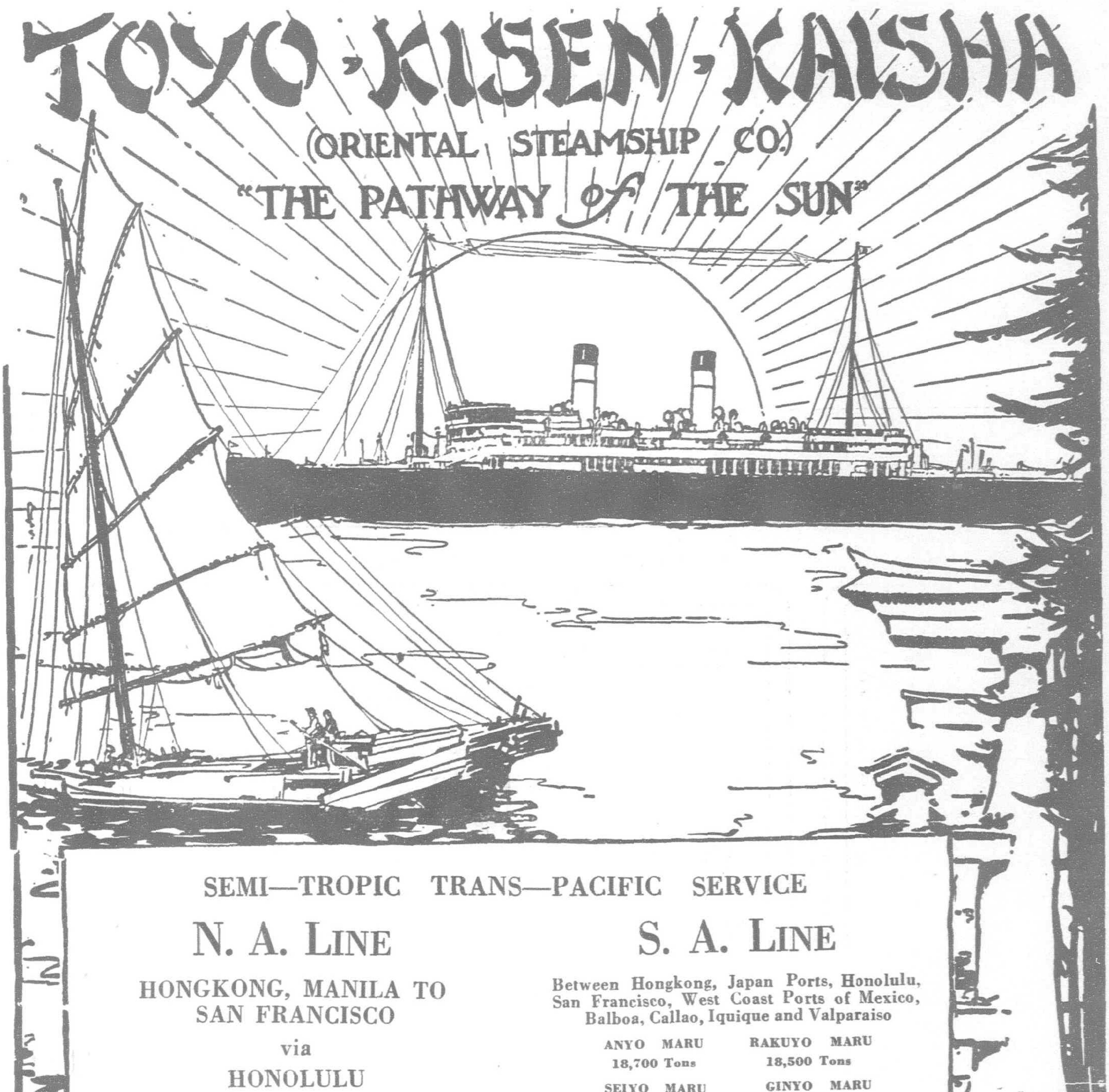

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Nominal Capital	- -	Yen 100,000,000.00
Paid-up Capital	- -	,, 87,500,000.00
Aggregate Tonnage	- -	500,000 Tons

FLEET OF STEAMSHIPS

Name	Tons D.W.	Name	Tons D.W.
Rozan-Maru	8,700	Capetown-Maru	9,100
Vancouver-Maru	9,100	Suez-Maru	6,600
Boston-Maru	8,800	Daio-Maru	9,000
Tofuku-Maru	9,100	Kashu-Maru	8,800
Chifuku-Maru	9,100	No. 2 Kifunesan-Maru	5,000
Ryufuku-Maru	9,100	Yousan-Maru	5,000
Hankow-Maru	6,400	Taisan-Maru	5,000
Yoni-Maru	11,000	Yuri-Maru	11,000
Taibu-Maru	8,900	Texas-Maru	11,000
San Francisco-Maru	9,100	Tamatsu-Maru	6,600
Naple-Maru	9,100	Eifuku-Maru	9,100
Glasgow-Maru	9,100	Kifuku-Maru	9,100
Yayoi-Maru	8,700	Toyofuku-Maru	9,000
Yaye-Maru	11,000	Raifuku-Maru	9,100
Malta-Maru	8,700	Keifuku-Maru	9,100
Buyo-Maru	8,800	Washington-Maru	9,100
Brazil-Maru	9,100	Tokufuku-Maru	9,100
Kofuku-Maru	9,100	Portland-Maru	9,100
Yezari-Maru	6,900	England-Maru	9,100
Yugao-Maru	5,000	Chili-Maru	9,100
Yubaye-Maru	5,000	Argentine-Maru	9,100
Sydney-Maru	6,400	Port Said-Maru	9,100
Shanghai-Maru	6,400	New York-Maru	9,100
Singapore-Maru	9,100	Karorin-Maru	6,400
Jyufuku-Maru	9,100	Tasmania-Maru	6,400
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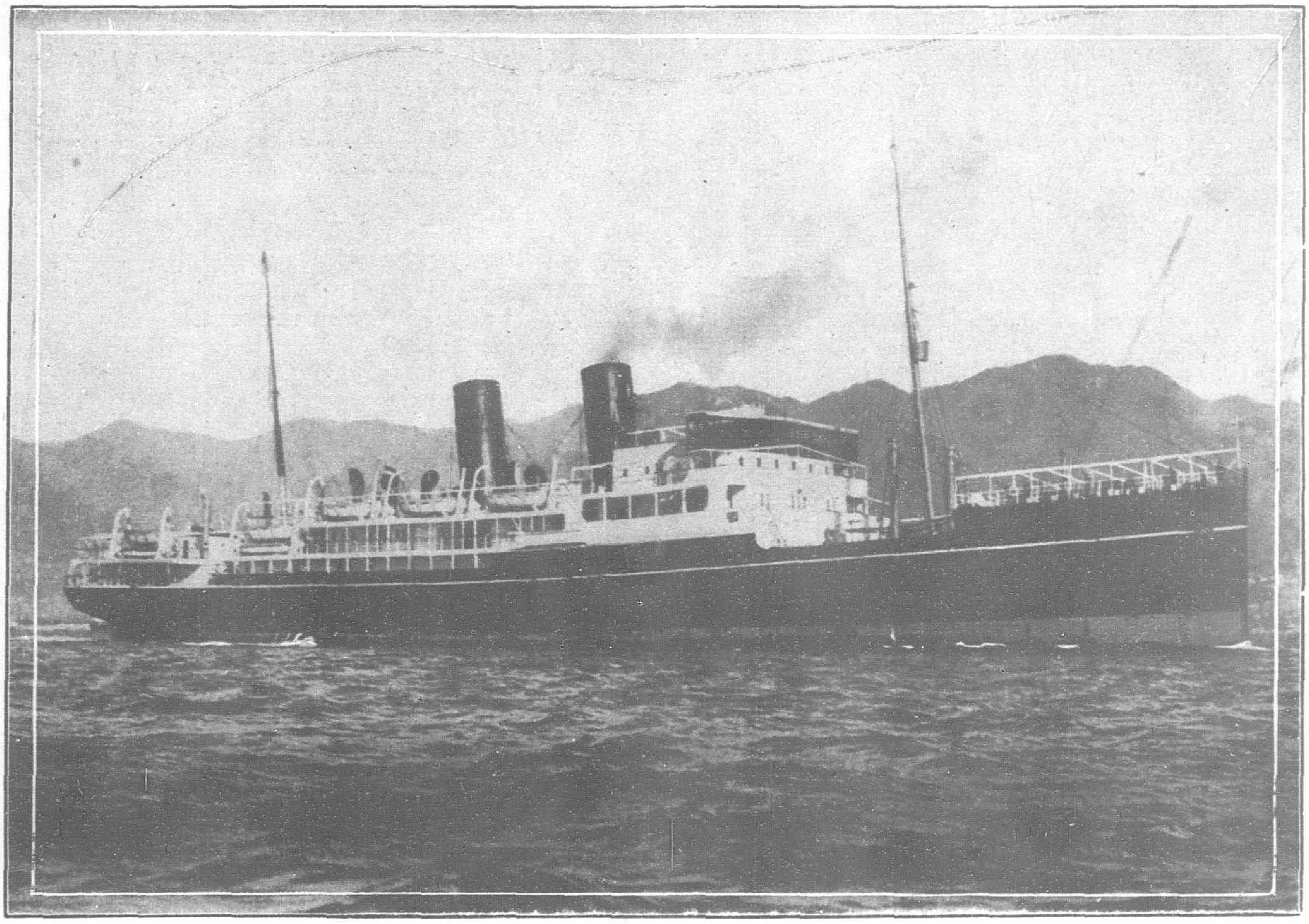

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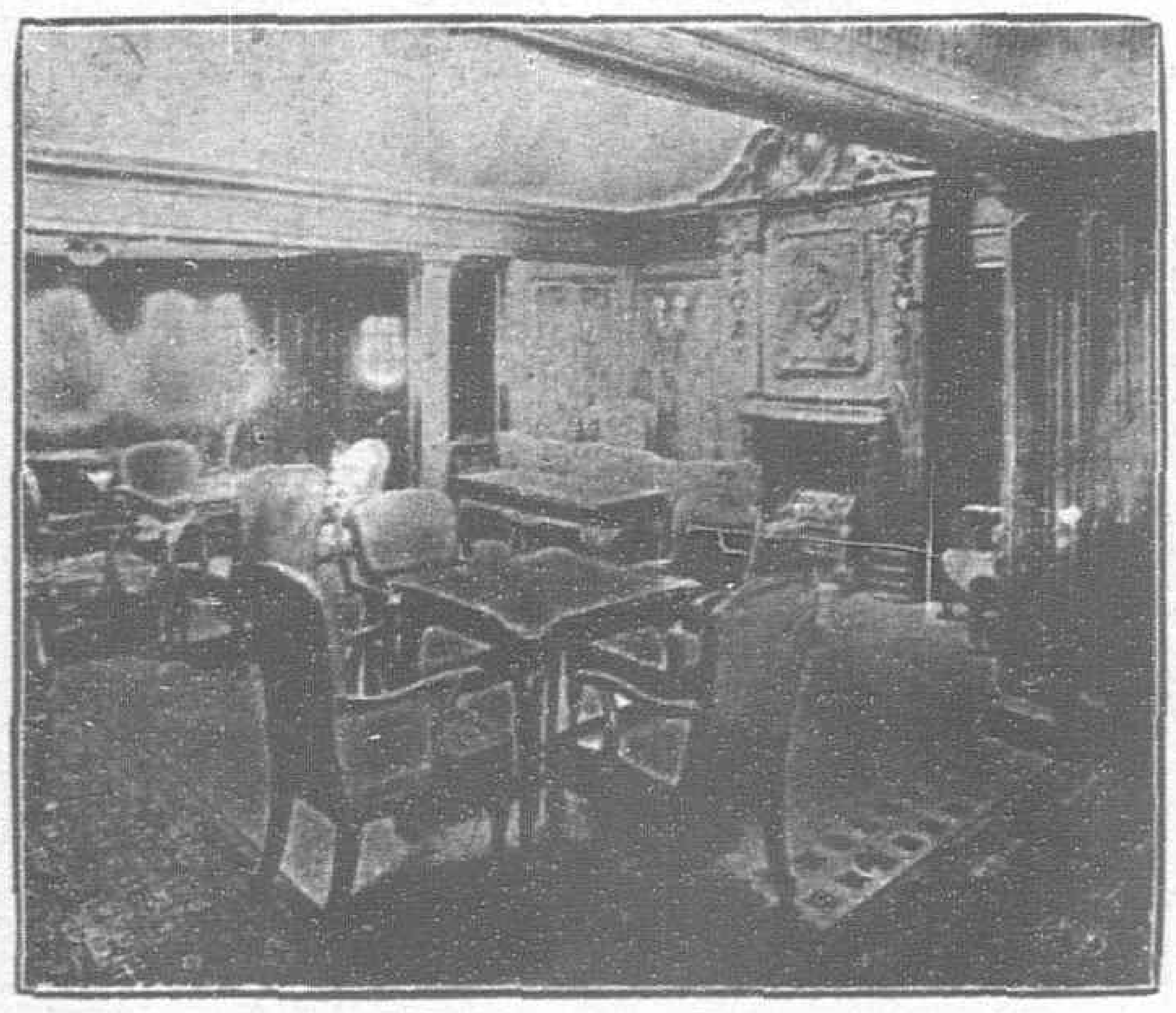
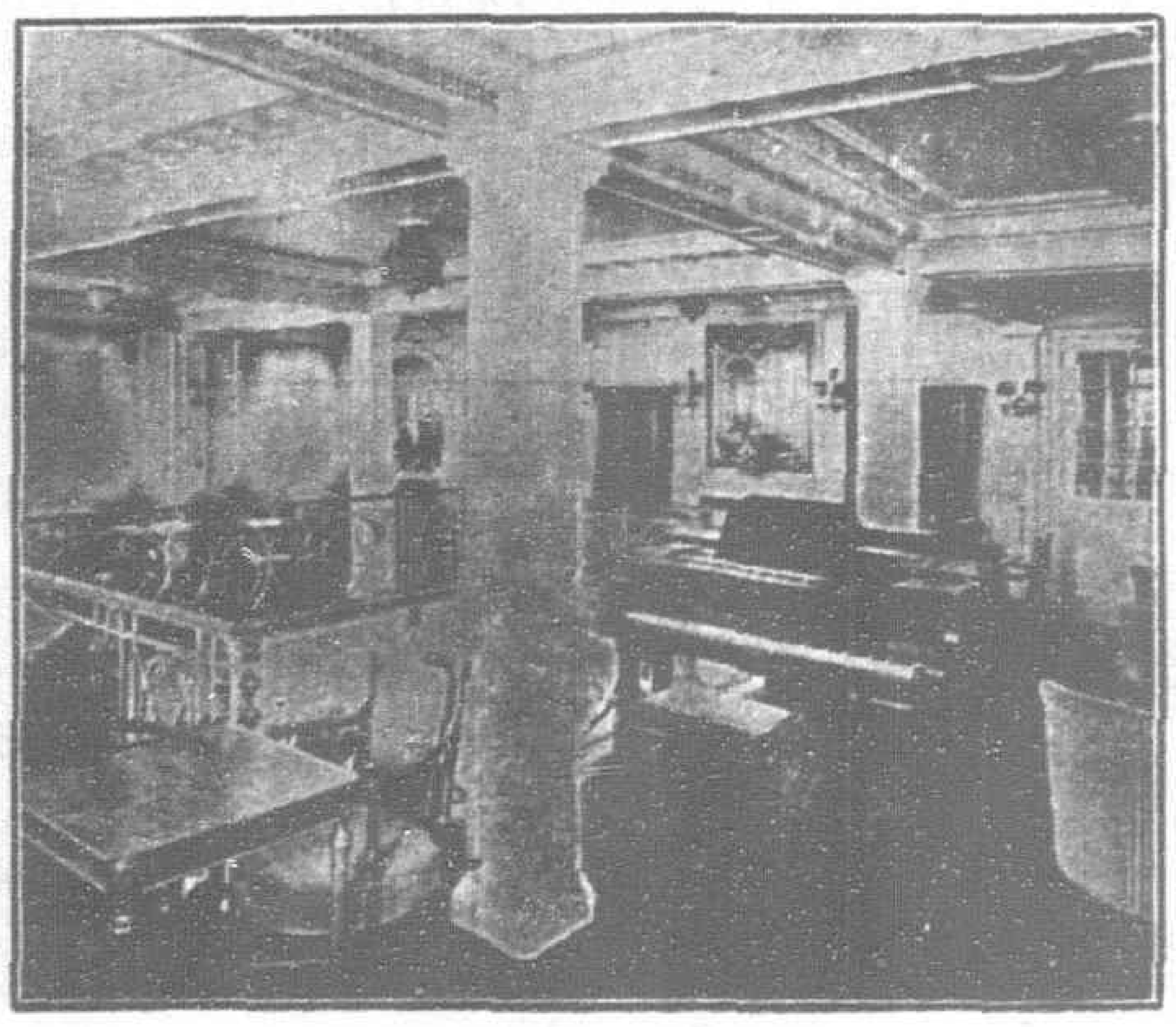
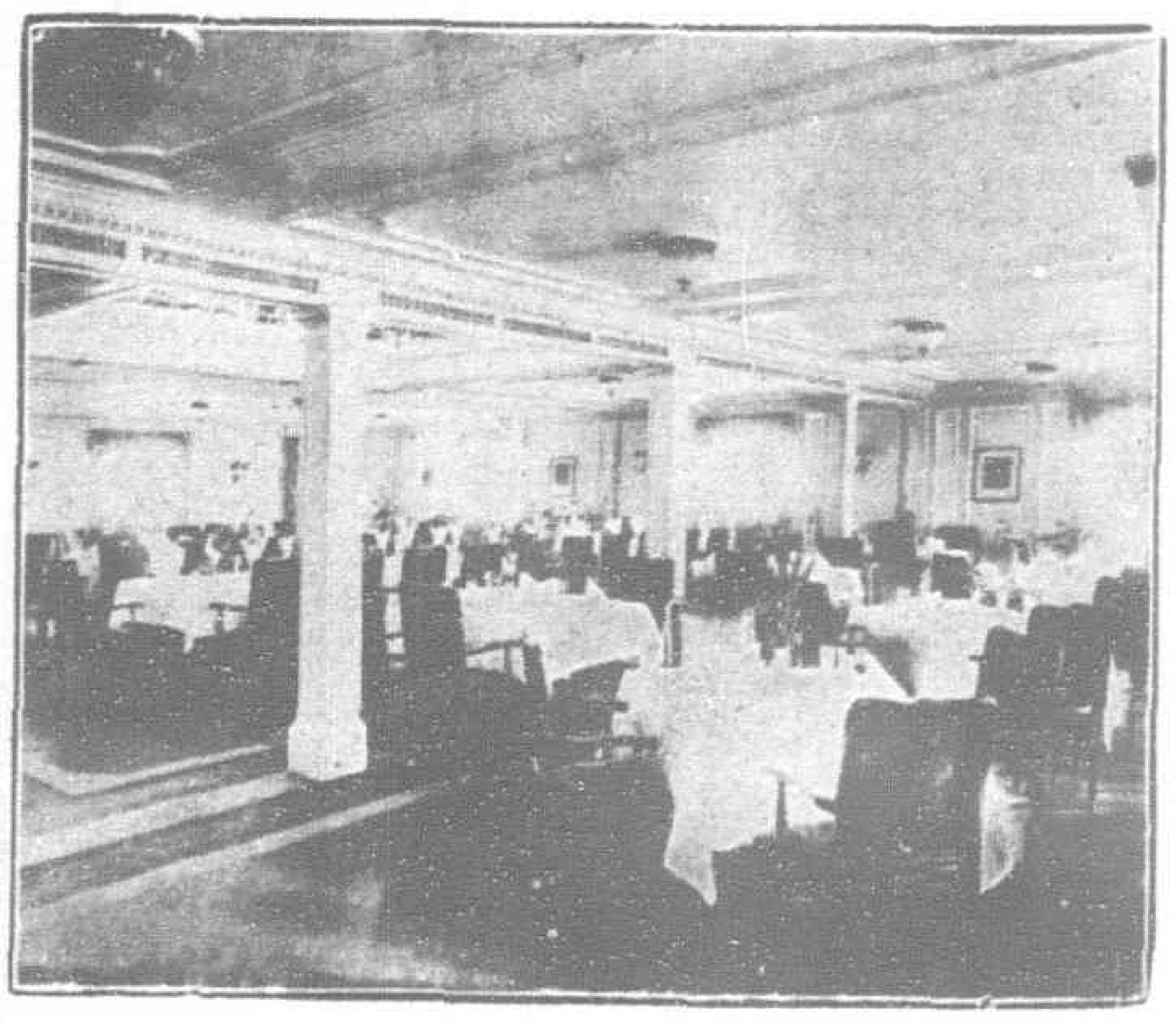


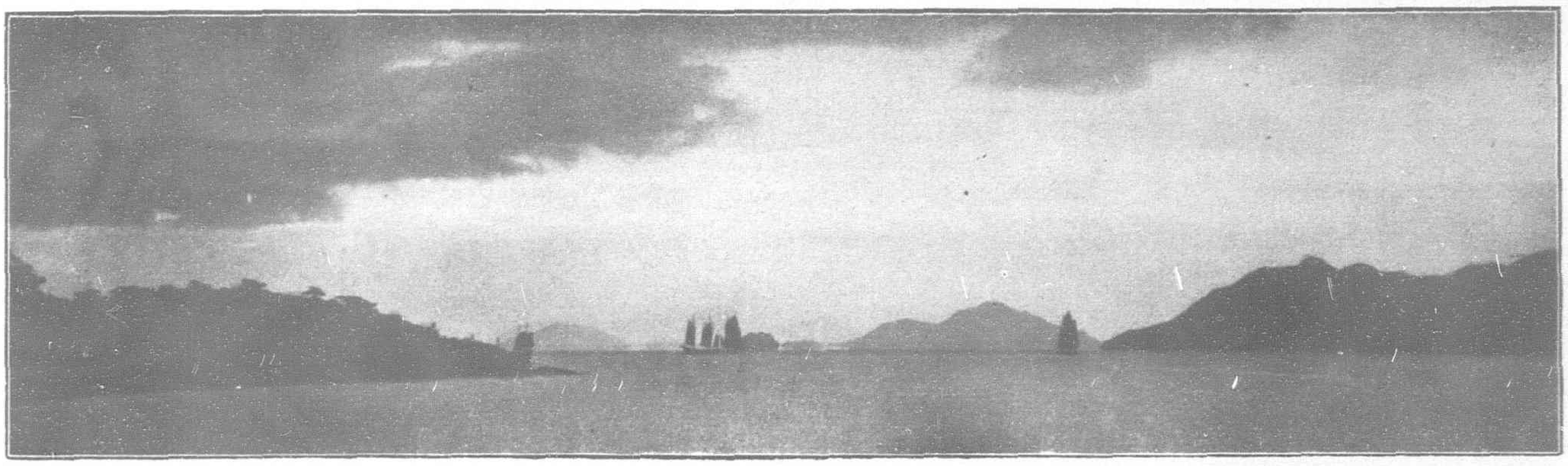
Smoking Room



Social Hall



Dining Saloon



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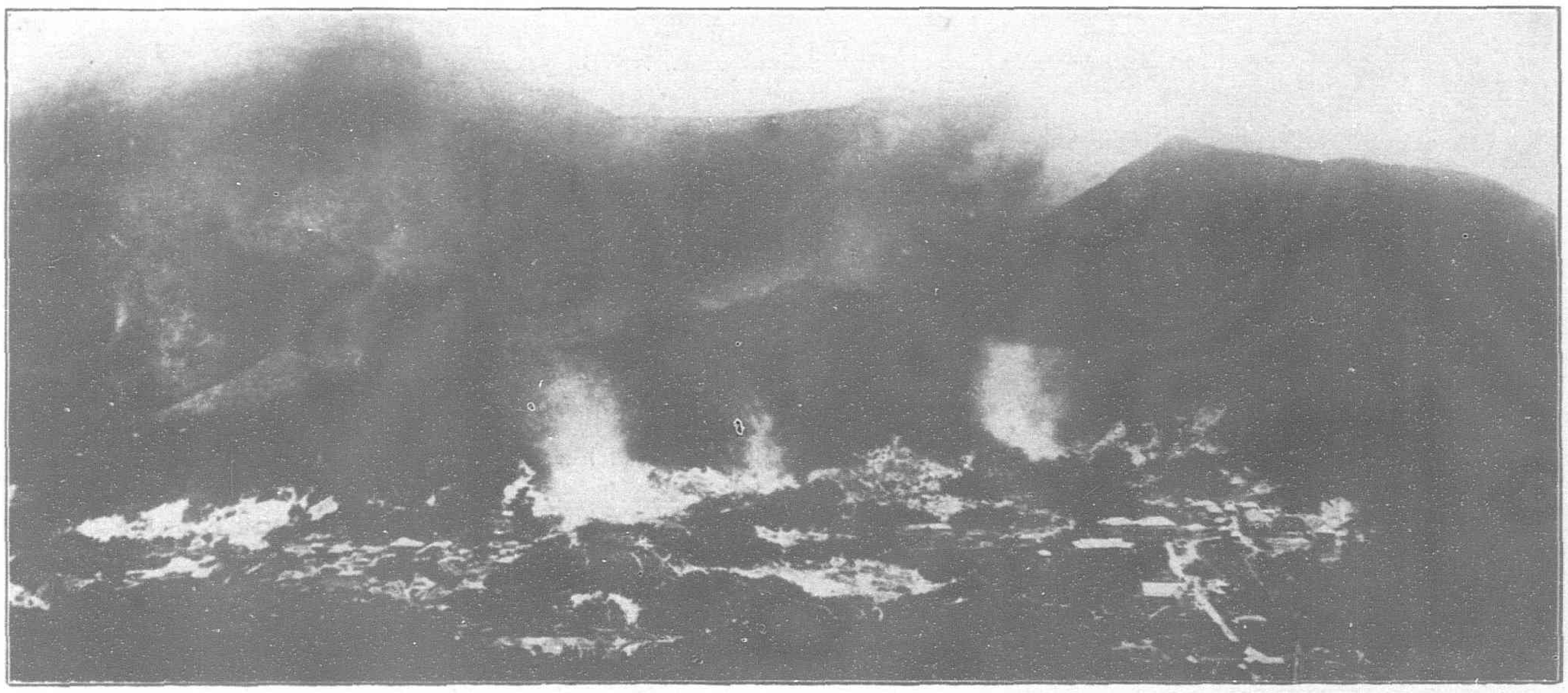

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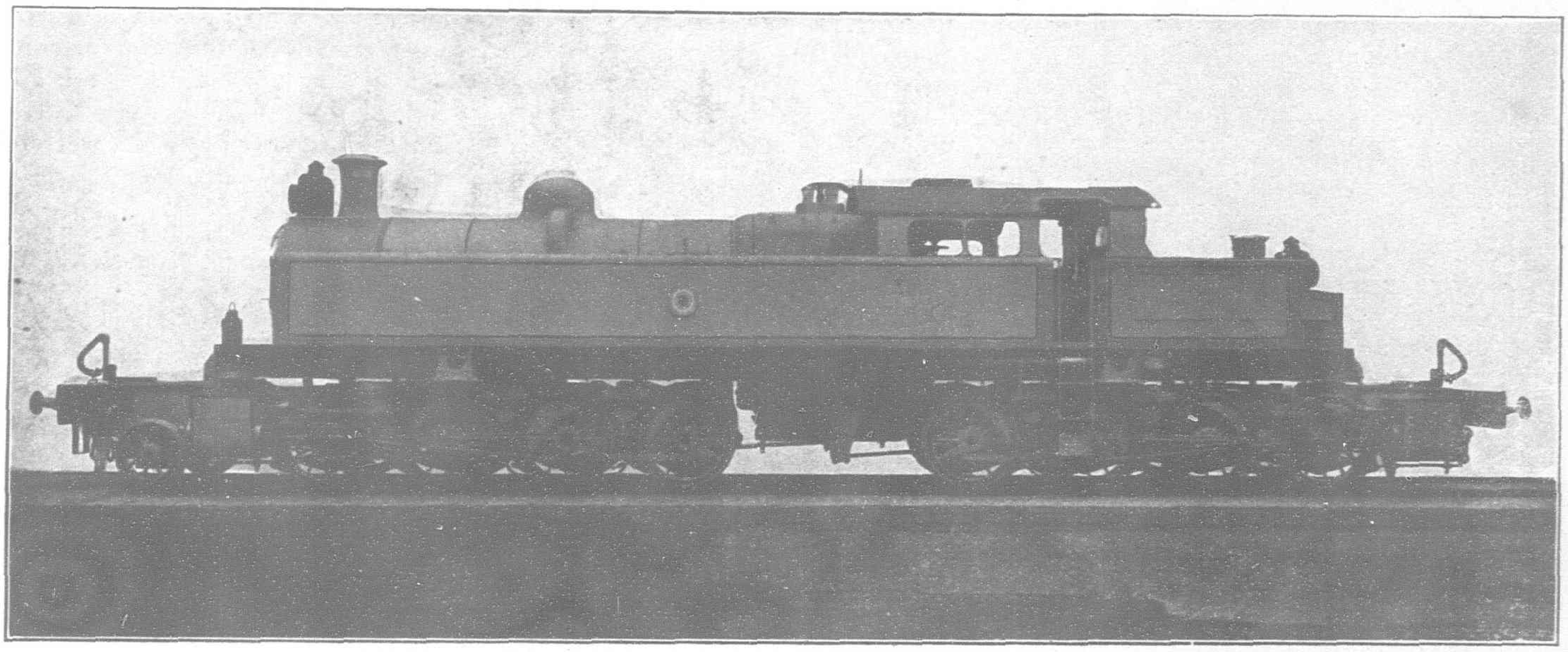

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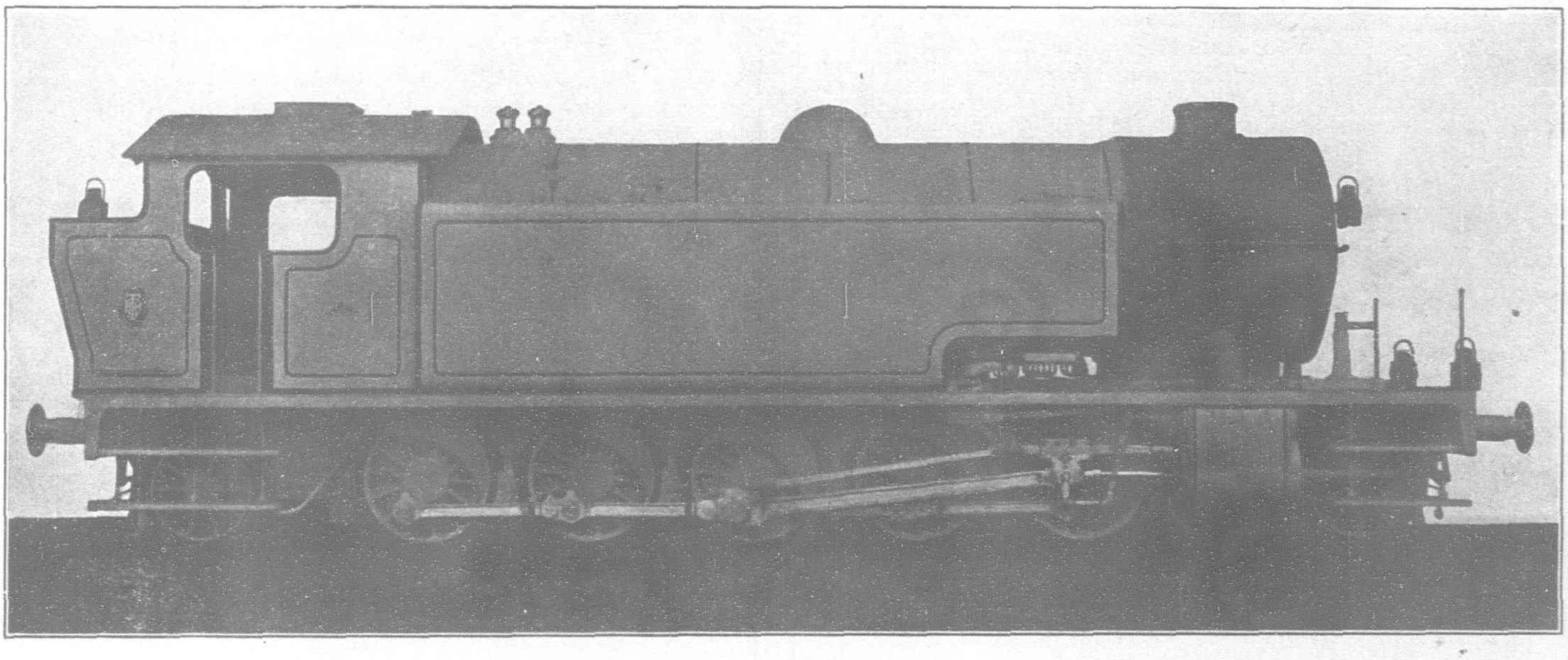

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Chinese Eastern Railway Publishes New Magazine

Beginning with the 1st of January, 1925, the Chinese Eastern Railway Administration is publishing a monthly illustrated magazine, the "Manchuria Monitor," each issue containing from 100-120 pages in the Russian language with a parallel English text, the Economical Bureau of the Railway being the editor.

The aim of this magazine is to enlighten the questions of economics and civilization in the Far East.

The journal will contain original articles and notes on the character and history of the population, its conditions of life, civilization, industry, finance, transport and natural resources of Far Eastern countries, and chiefly Manchuria, international relations, bibliography, etc.

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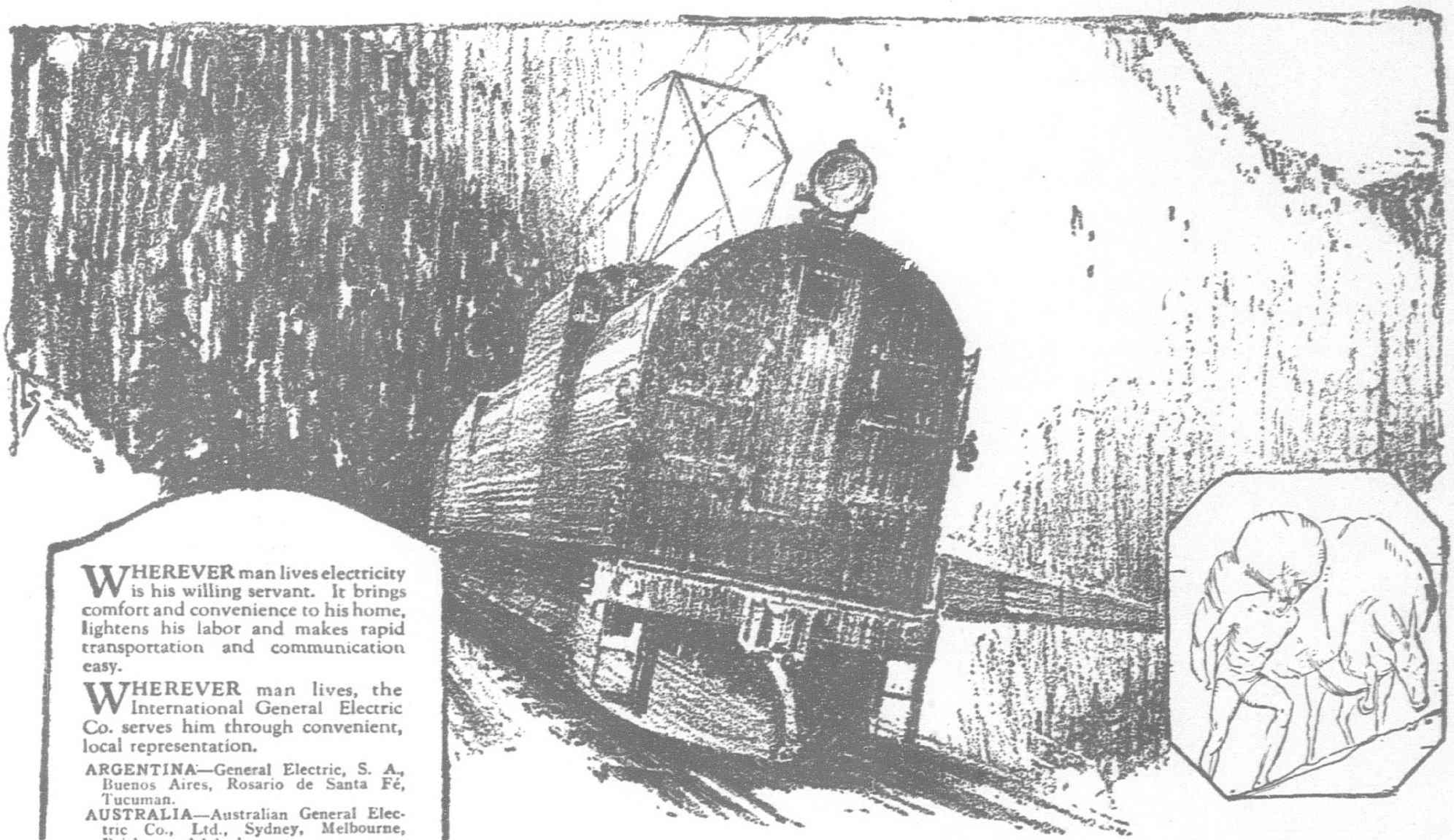

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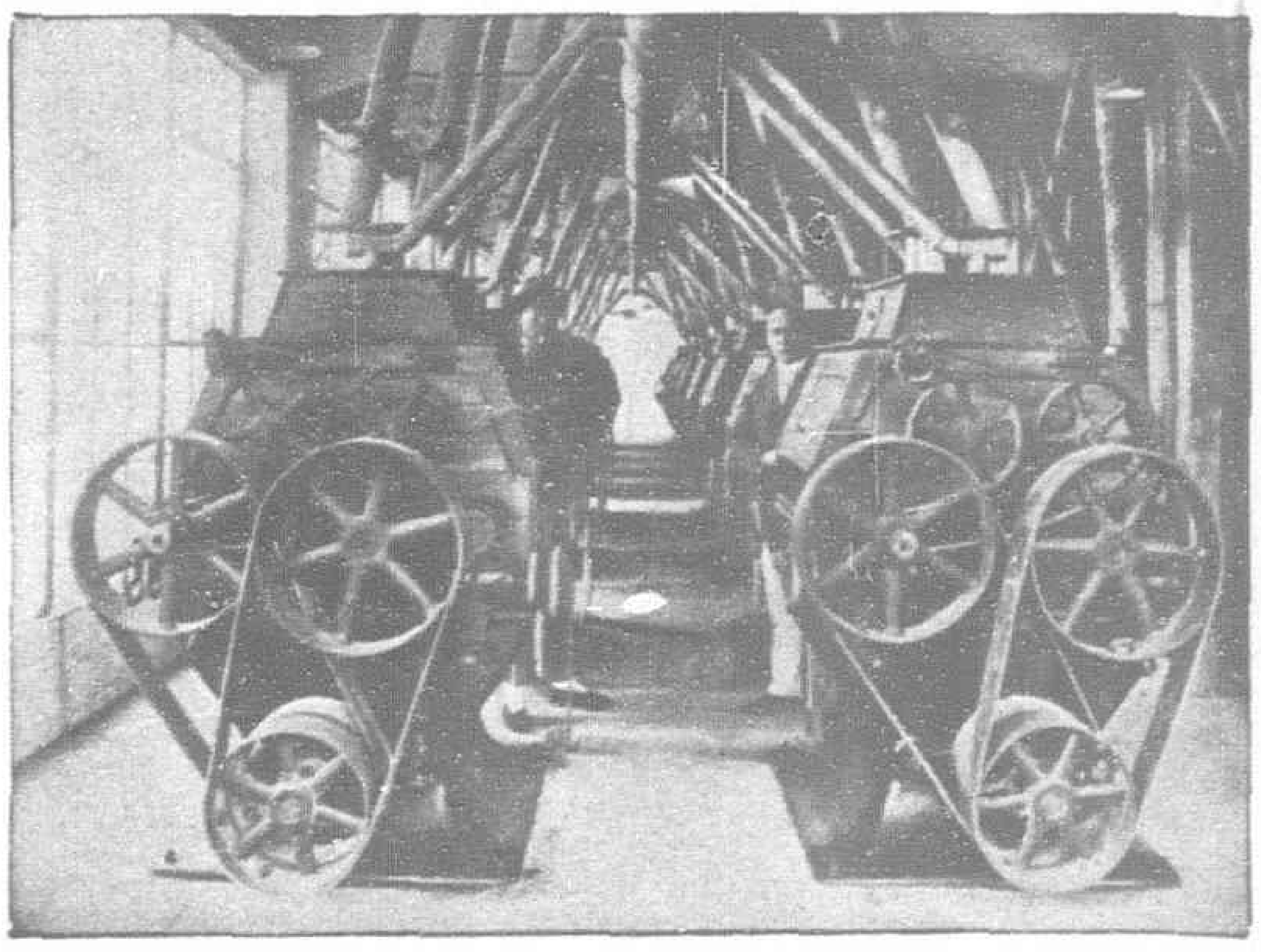

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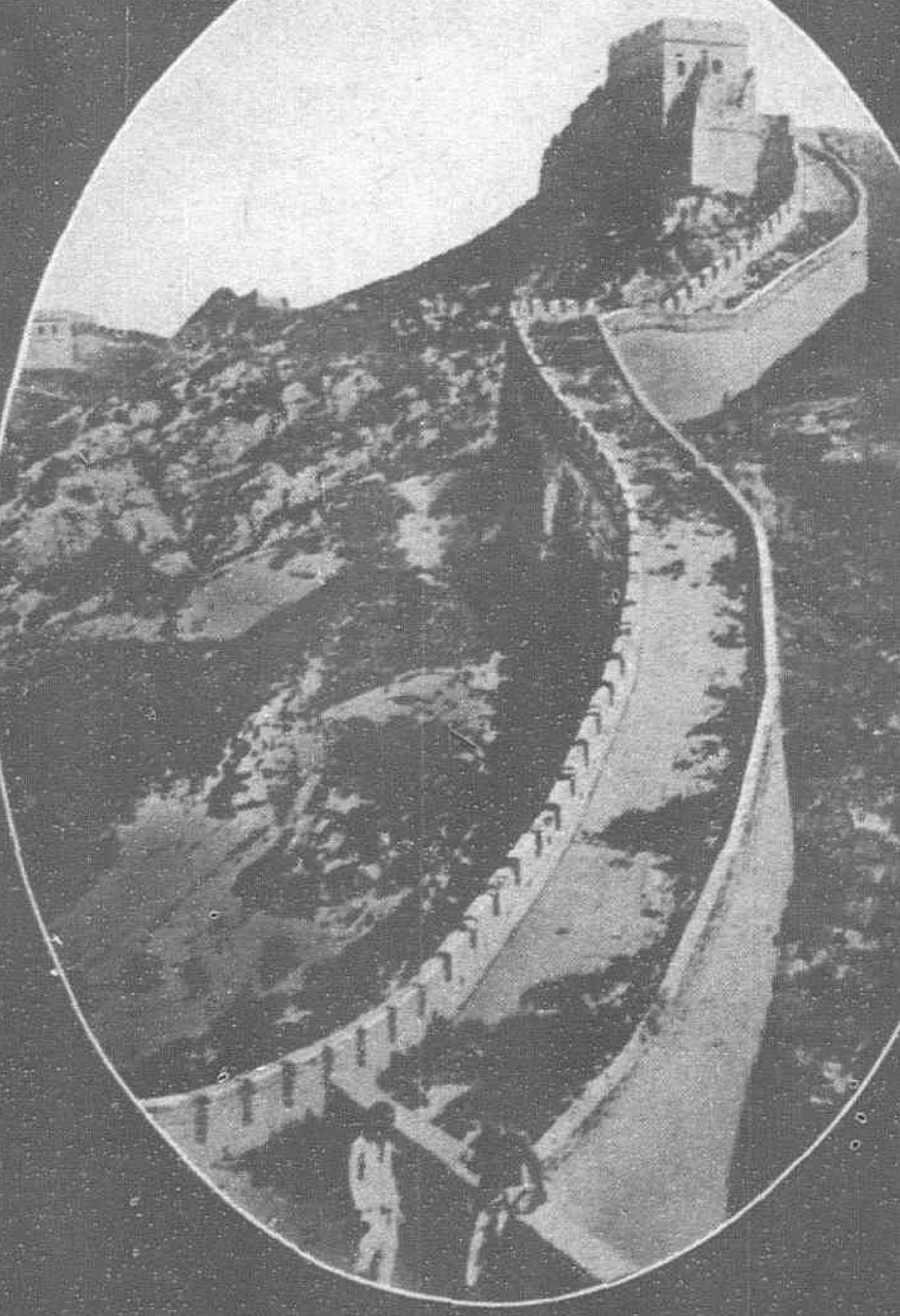

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***Directors*: Prince Iwao Matsukata, Viscount Yukiyoshi Aoyama, Yoshiteru Shimidzu, Esq., The Hon. Nagayuki Asano, Masao Matsukata, Esq., Masakadzu Hisano, Esq. and Isami Sakihana, Esq.**

***Head Office Manager*: Eikichi Tatsuoka, Esq.**

***Head Office*: No. 6, 7chome, Kobiki-cho, Kyobashiku, Tokyo.**

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THE

MITSUBISHI BANK,

LIMITED

CAPITAL SUBSCRIBED -	Yen 50,000,000
CAPITAL PAID-UP - - -	Yen 30,000,000

CHAIRMAN:

Mr. Manzo Kushida

MANAGING DIRECTORS:

Mr. Kiyoshi Sejimo
Mr. Takeo Kato
Mr. Toru Otobe

HEAD OFFICE:

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Tokyo, Japan.

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Agents for the Hongkong and Shanghai Banking Corporation

THE MITSUI BANK, LTD.

The Oldest Bank in Japan, Founded in 1673

Capital Subscribed... ....Y.	100,000,000.00
Capital Paid-Up................Y.	60,000,000.00
Reserve Funds (Sept., 1925) Y.	51,400,000.00

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Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED - - - - - - Yen 50,000,000

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ICHIMATSU HORAI, Esq.
KOZO MATSUMOTO, Esq.
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AUDITORS:

TAICHI OBA, Esq.
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3.—Deposits and safe custody of valuables.
4.—Trust company business.
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Hongkong and Shanghai Banking Corporation

(INCORPORATED IN HONGKONG)

Capital:	Authorised Capital	$50,000,000
	Issued and fully paid up	$20,000,000
Reserve Funds:	Sterling	£4,500,000
	Silver...	$26,500,000
	Reserve Liability of Proprietors	$20,000,000

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ILOILO
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SUNGEI PATANI
TIENTSIN
TOKYO
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(DAI HYAKU GINKO)

ESTABLISHED 1878

HEAD OFFICE: TOKYO, JAPAN

CAPITAL - - - - - - - - - - -	Yen 25,000,000.00
RESERVE FUND AND UNDIVIDED PROFIT - -	Yen 10,935,821.00

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WORKS:	
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OSAKA, JAPAN

Capital Subscribed: Yen 12,000,000

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Capital Subscribed: Yen 10,000,000

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THE SUMITOMO BANK, LTD.

KITAHAMA, OSAKA, JAPAN

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Paid-up Capital	Yen 50,000,000
Reserve & Surplus Funds	Yen 25,490,000
Deposits	Yen 408,000,000

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N. YATSUSHIRO	Managing Director
S. IMAMURA	,, ,,
K. YUKAWA	Director
K. NAKADA	Director
K. HORI	,,
S. YOSHIDA	,,
K. OHDAIRA	,,

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Registered in the Ministry of Finance, 1918

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Managing Director .. .. W. Kobayashi, Esq.

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Sub-Manager .. .. .. S. Uyeda, Esq.

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Manager .. .. Shieh Ling, Esq.,
Sub-Manager .. .. .. R. Tonegawa, Esq.

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Sub-Manager .. .. .. H. Yokoyama, Esq.

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Established 1899

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Telegraphic Address: TAIWANGINK

Telephones:
3421, 4539, 4540, 5617, 5618 & 2326 Ushigome

Capital Subscribed .. .. Y. 60,000,000
Capital (Paid-up) .. .. Y. 52,500,000
Reserve Fund .. .. .. Y. 14,180,000

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Vice-President :
Hirozo Mori, Esq.

Directors :
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Tadasu Hisamune, Esq.
Denkichi Takita, Esq.
Masakazu Shuto, Esq.

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(FORMERLY THE FIRST NATIONAL BANK)
ESTABLISHED 1873

Capital (Paid Up) - - - -	**Yen 50,000,000.00**
Reserve Funds - - - - -	**Yen 46,400,000.00**

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CAPITAL SUBSCRIBED - - - - -	**Yen 150,000,000**
CAPITAL PAID-UP - - - - - - -	**" 92,750,000**
RESERVE FUNDS - - - - - - -	**" 48,650,000**
DEPOSITS - - - - - - - - - -	**" 572,514,504**

Head Office: Nichome, Eiraku-cho, Marunouchi, Tokyo, Japan

President	ZENJIRO YASUDA
Vice-President	TOYOTARO YUKI
Managing Director	TEIZABURO TAKEUCHI
" "	HISASHI HYOSU

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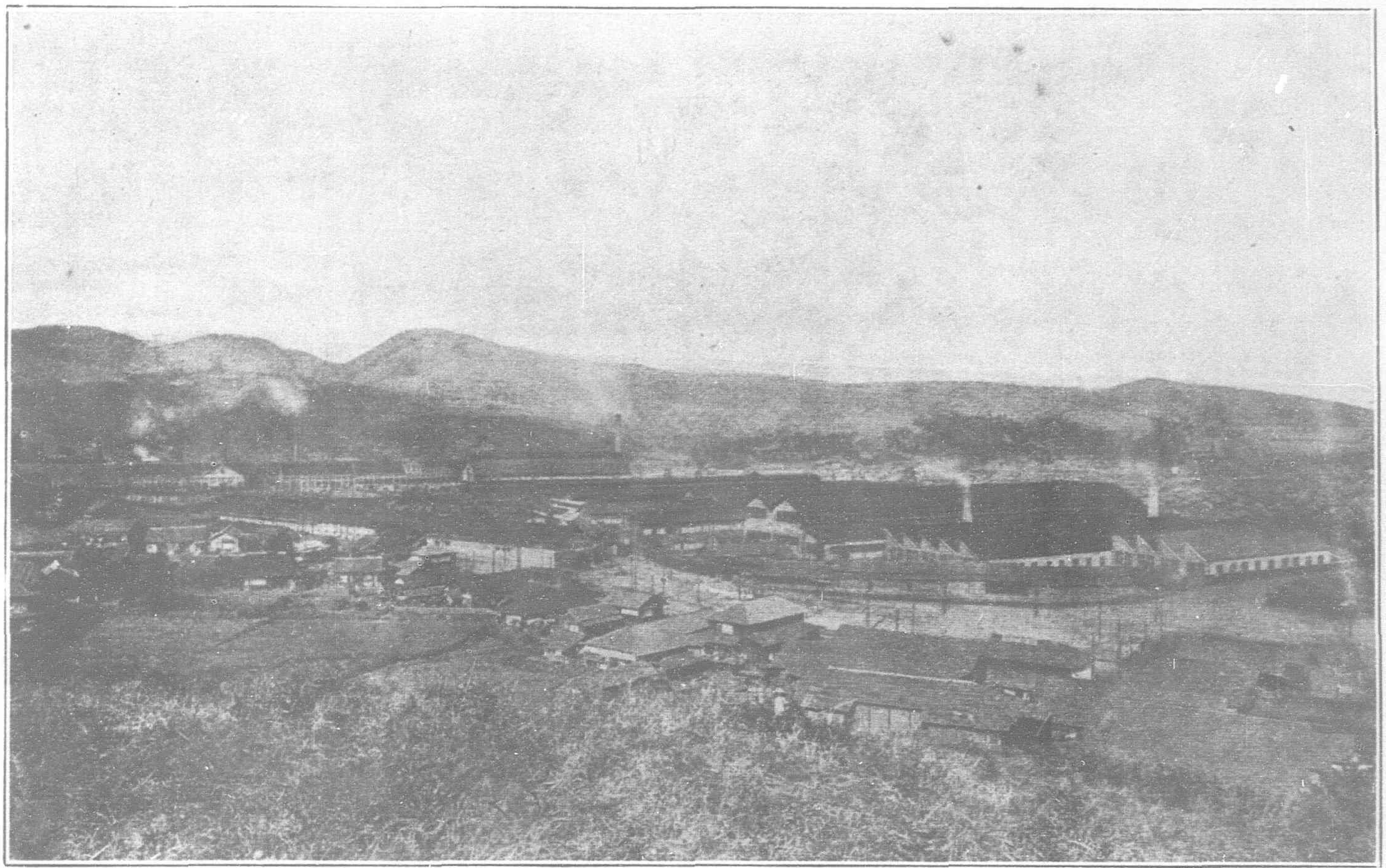

General View of Hidachi Engineering Works

Location of Plant :

SUKEGAWA, IBARAKI PREFECTURE, JAPAN.

Sales Departments :

KUHARA MINING COMPANY OFFICES, 1 ITCHOME, YAESUCHO, KOJIMACHI-KU, TOKYO.

KUHARA MINING COMPANY OFFICES, 90 NICHOME, KITAHAMA, HIGASHI-KU, OSAKA.

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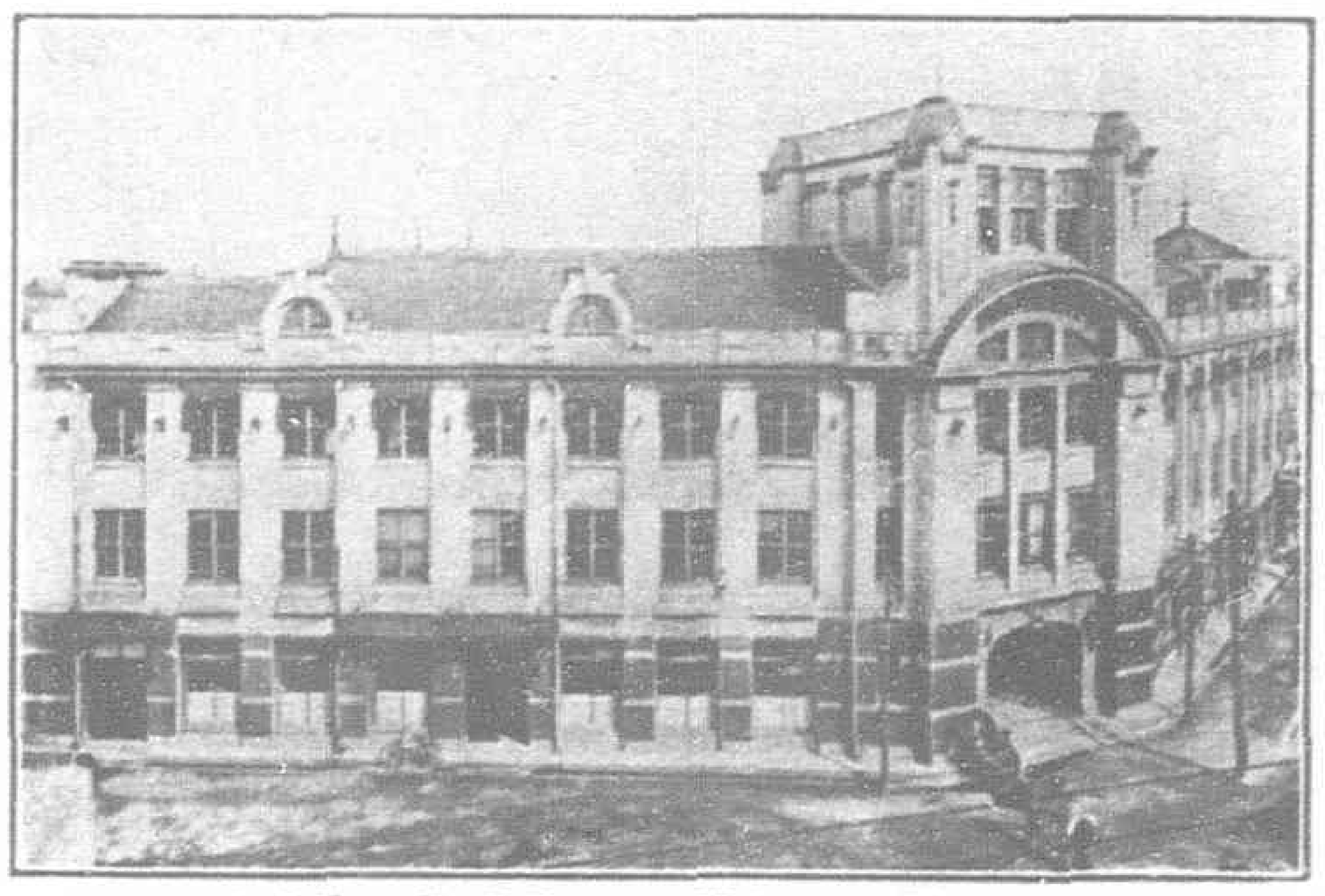
Cable Address: MANTETSU or SMRCO. Codes: A.B.C. 5th & 6th Editions, A 1 Lieber's, and Bentley's



General Office Building of Ujigawa Electric Power Co., Ltd., Osaka, Japan.

Ujigawa Electric Power Co., Ltd.

Osaka, Japan.

Authorized Capital Yen 85,000,000.00

YASUSHIGE HAYASHI, *President and Director*

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9 Power houses (permit obtained) with a total capacity of	83,400 K.W.
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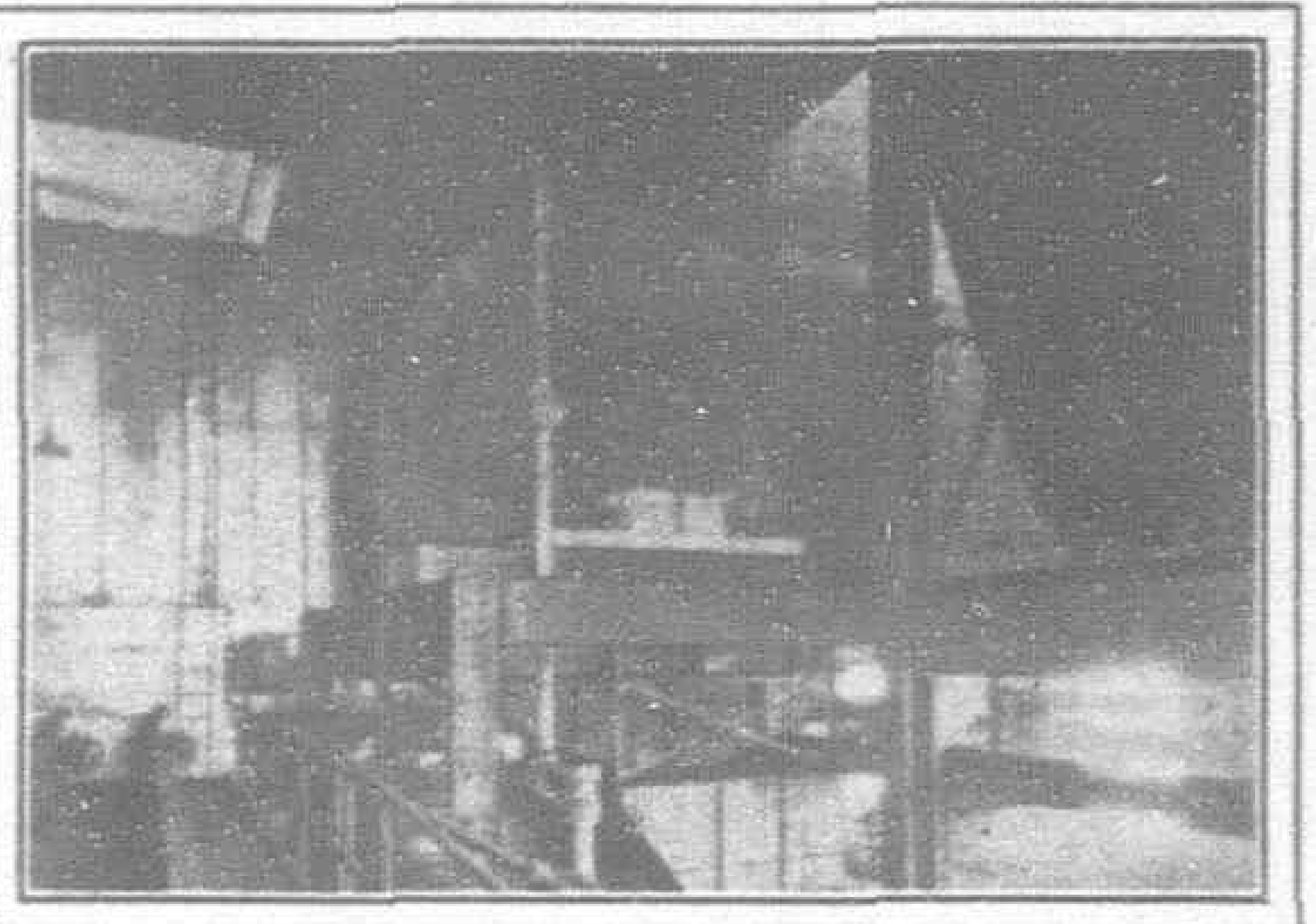
Its Customers	14,568
Electric Lights	319,186
Its Customers	146,040
Purchased Power	100,100 K.W.



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Double Purpose Fan -- Furnishes Induced Draft -- Collects Cinders

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In operation, the cinders are separated from the gases and dropped down into a hopper from which they can be easily removed.

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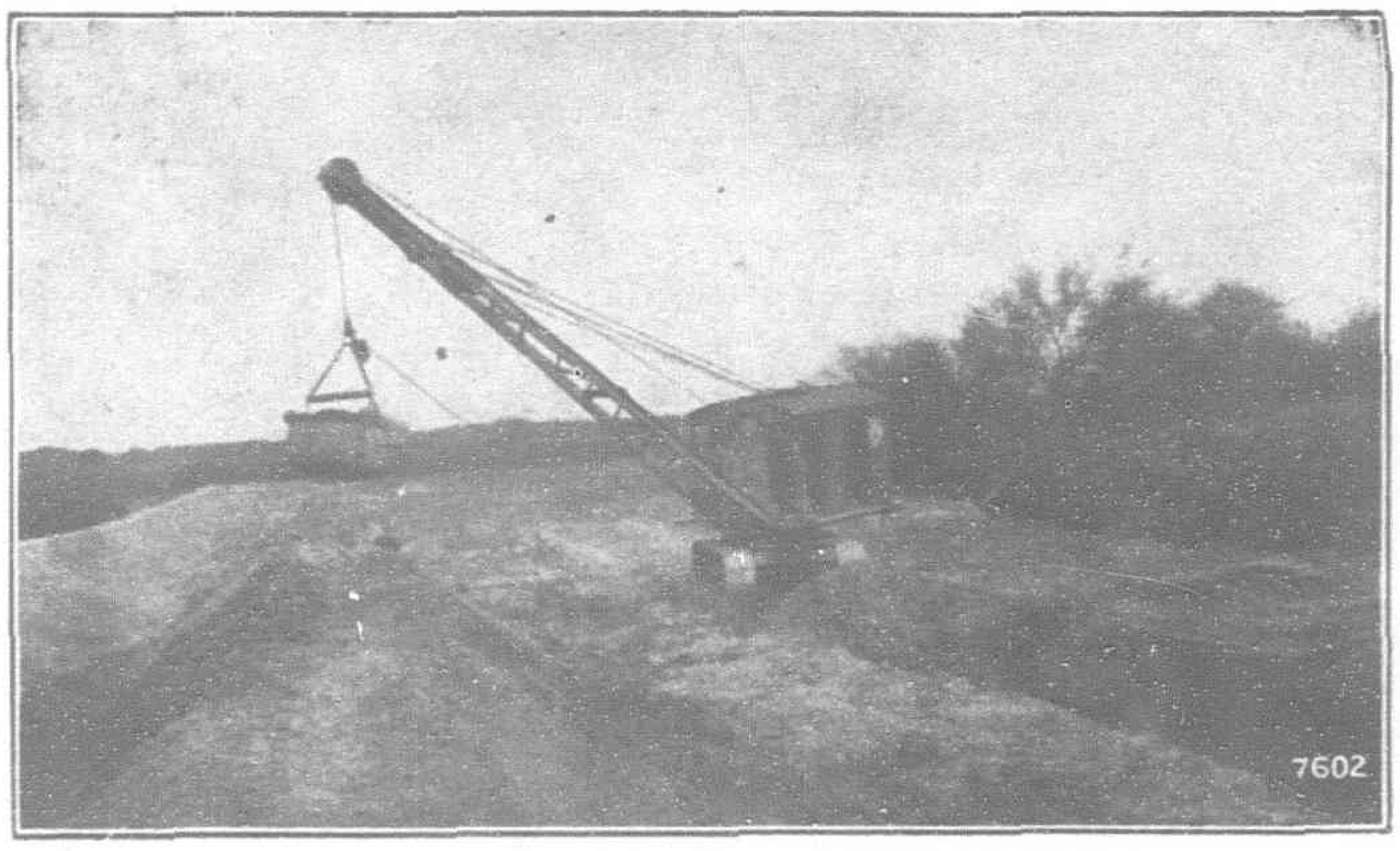

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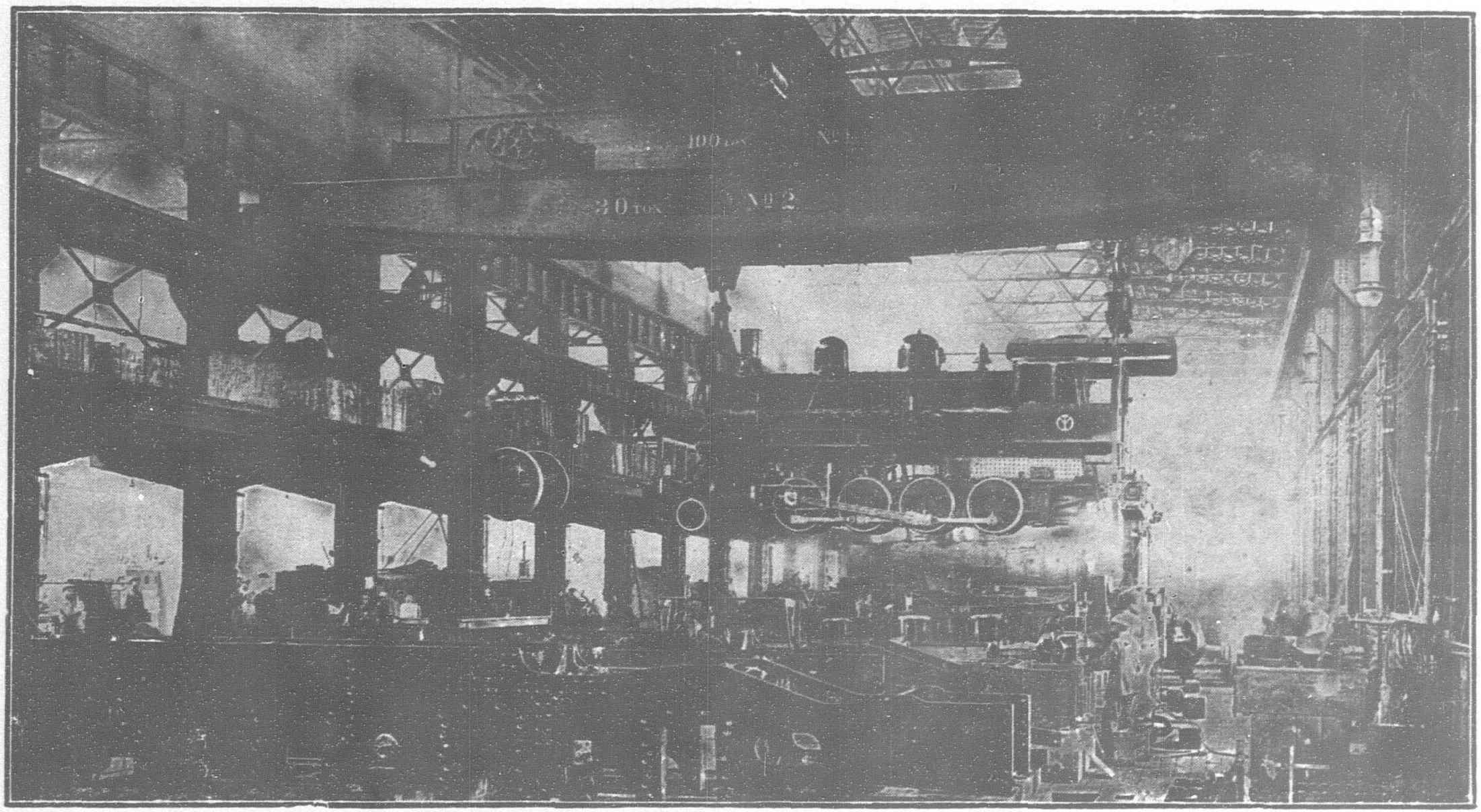
RAILWAY

SHAKAKO WORKSHOPS



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THE EAST IS EAST AND THE WEST IS WEST

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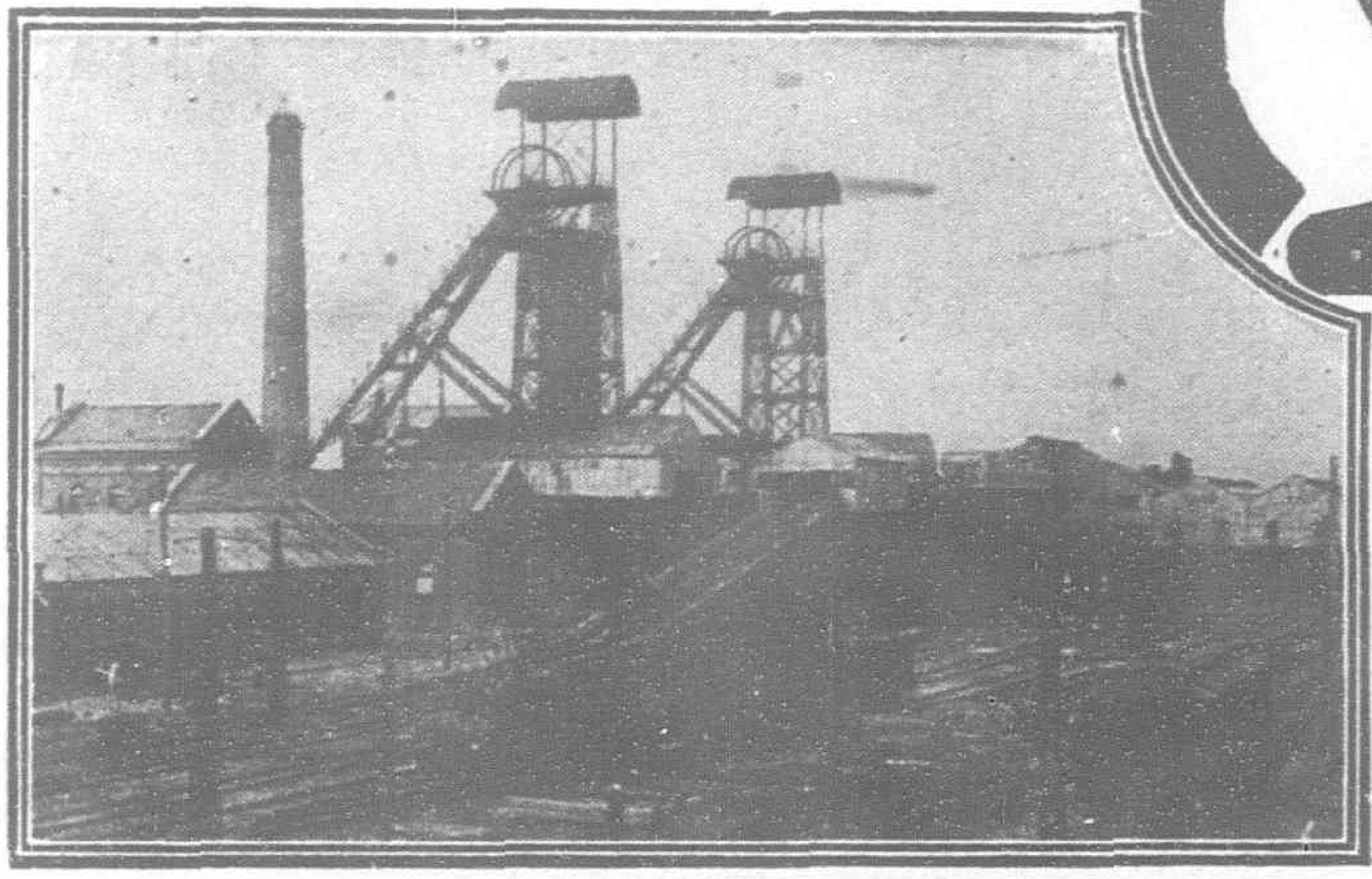

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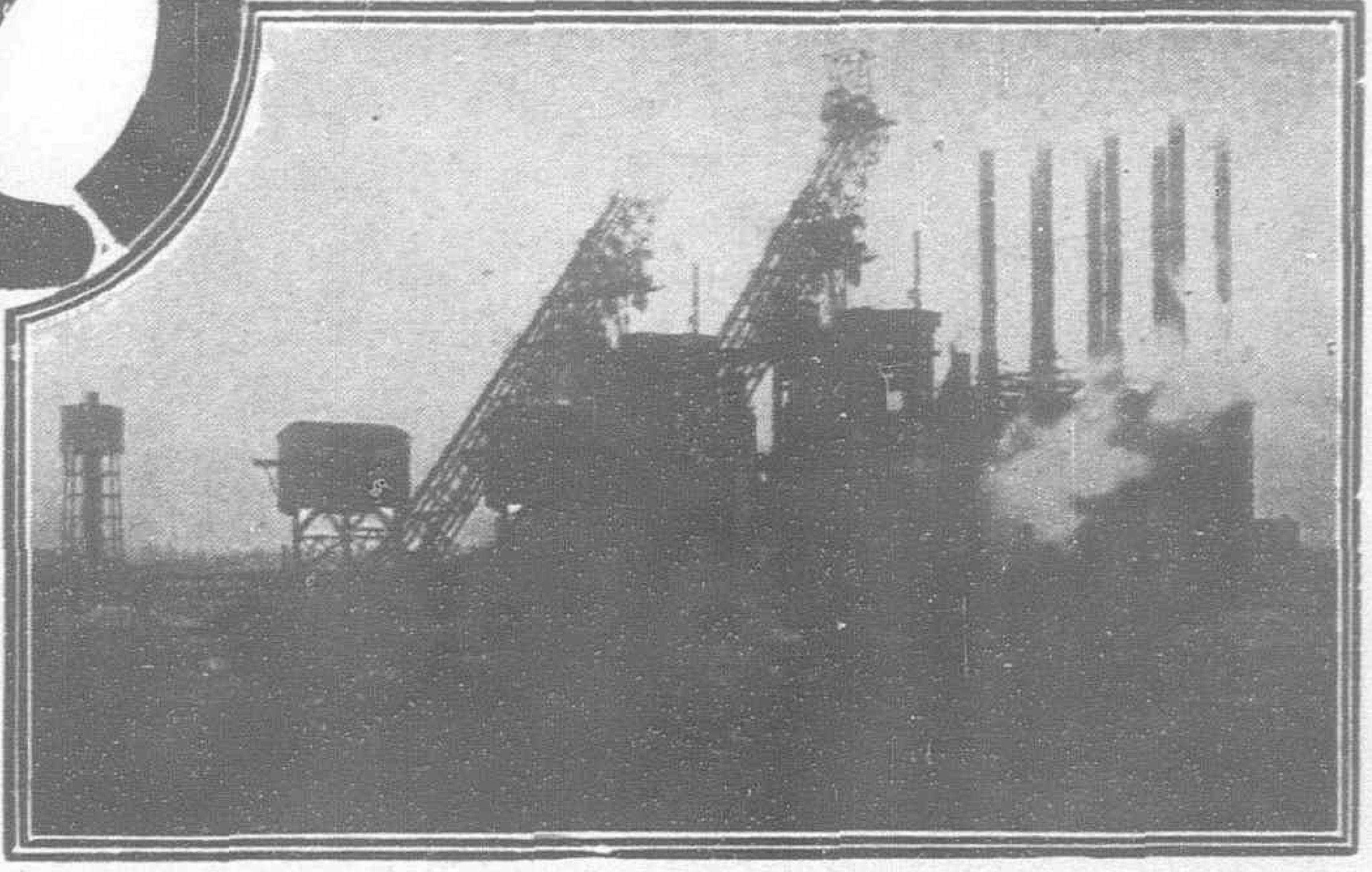

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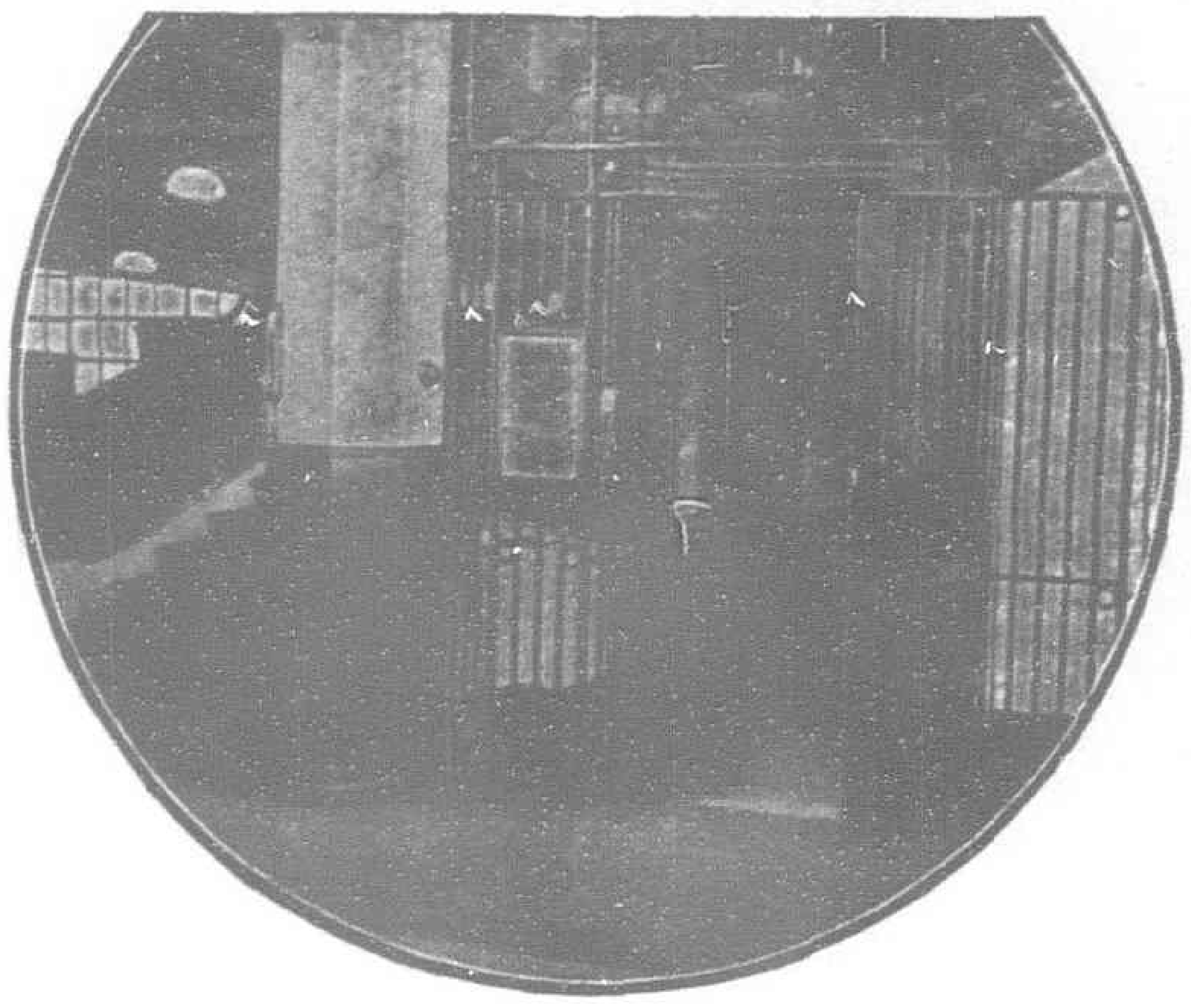

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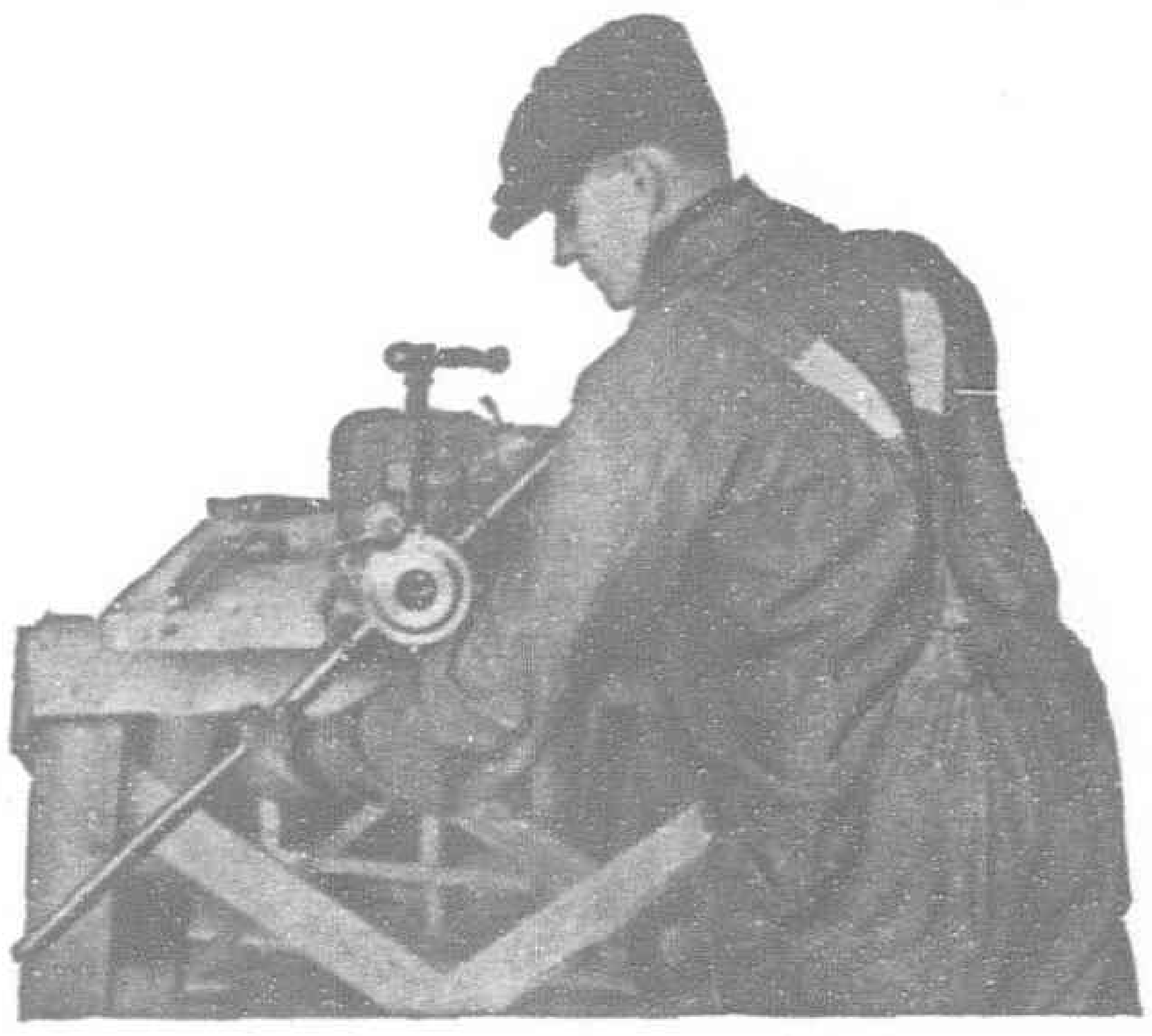

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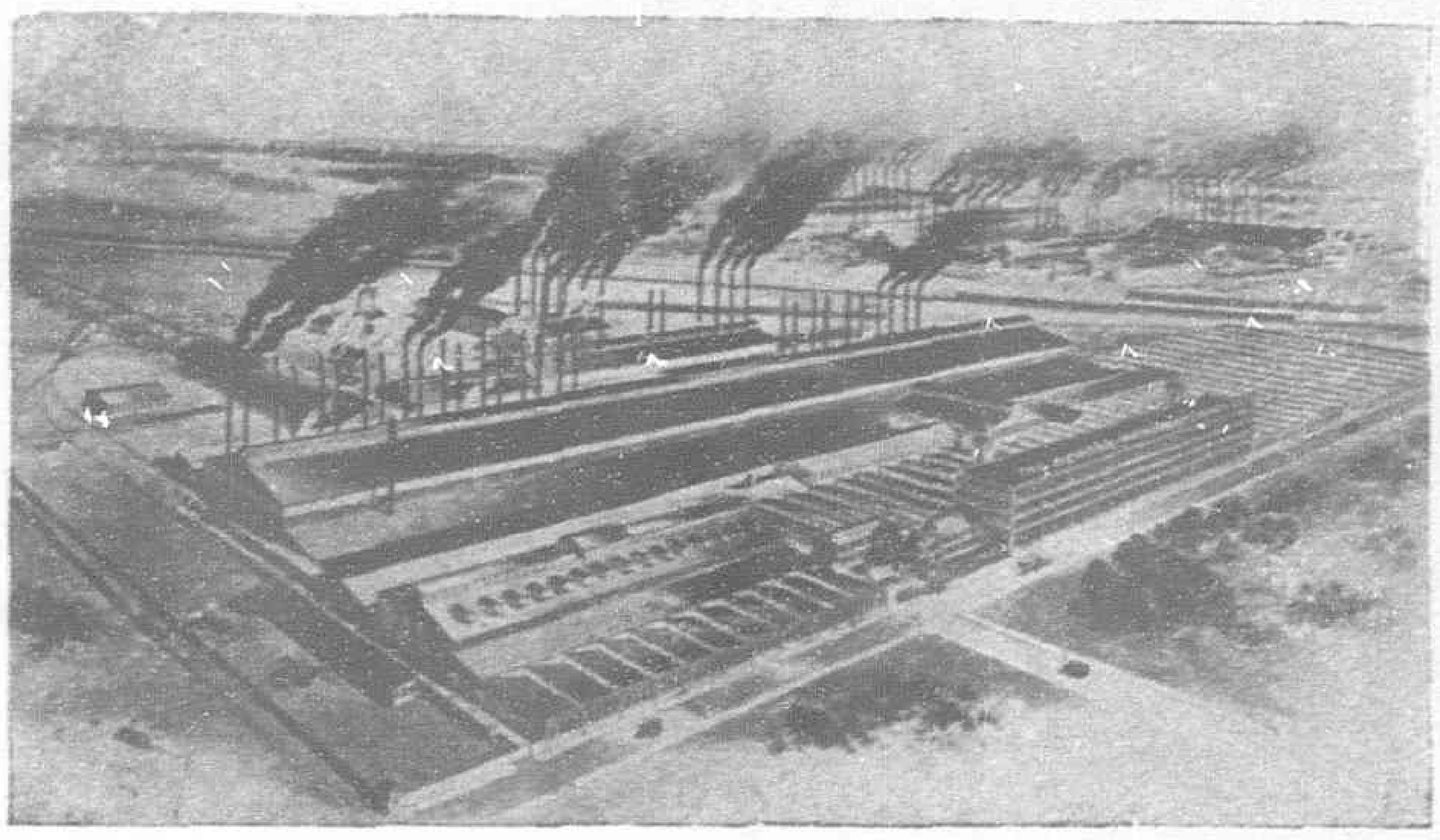

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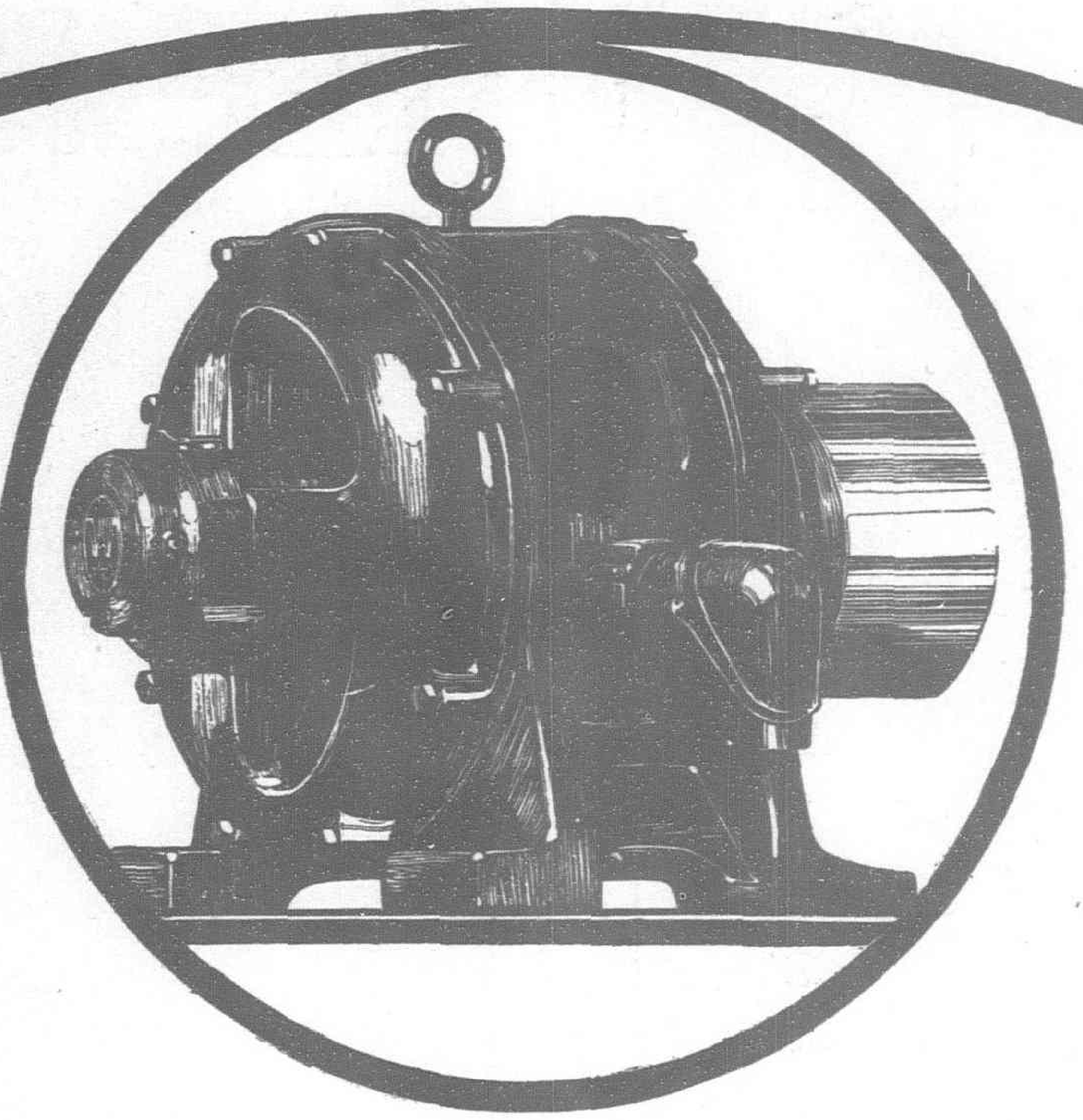

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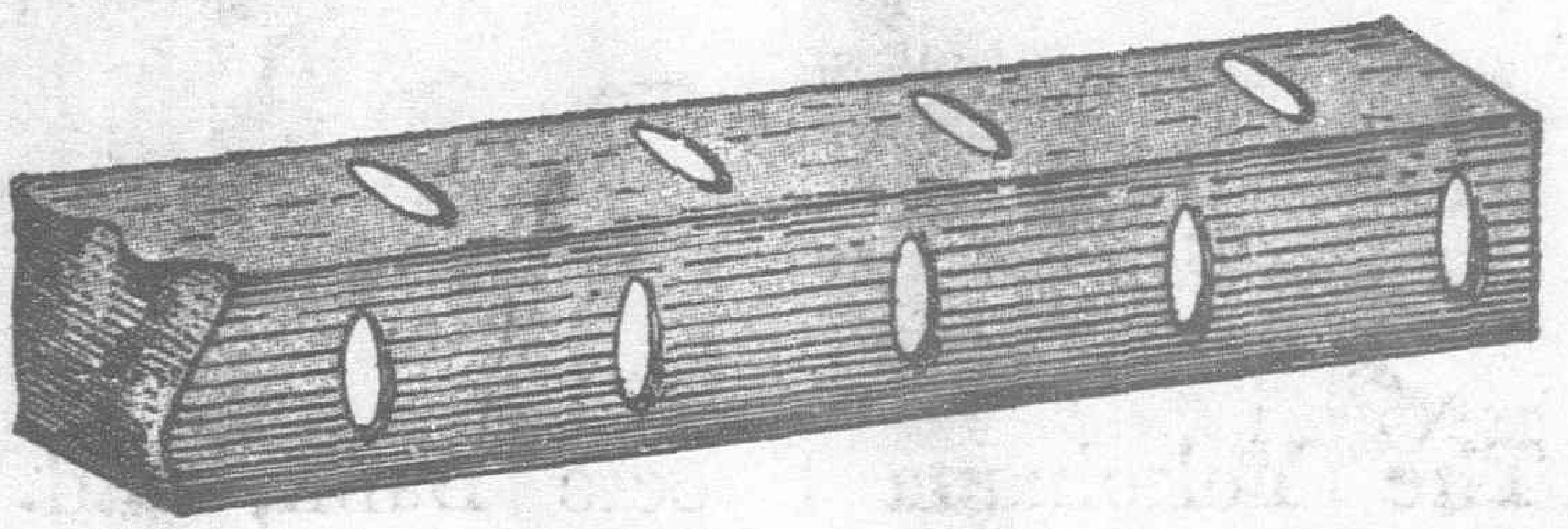

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

Vol. XXII SHANGHAI, JANUARY, 1926 No. 1

The Saving of Manchuria

When some of Marshal Chang Tso-lin's generals rebelled against him and started a civil war in Manchuria, Japan which has a special interest in the peace of that part of China, prevented fighting within the South Manchuria Railway Zone, which includes the city of Mukden, the capital of the province of Fengtien and the political center of Manchuria. By limiting the war to the areas away from the railway and by sending troops into the zone, Japan prevented Manchuria from suffering the destructions which have been the lot of other provinces of China because of the unceasing feudal wars. In taking this step, Japan in no way participated in the war. Japan took no sides as between Marshal Chang Tso-lin and General Kuo Sung-lin. Japan maintained a strict neutrality and as soon as the war was over, Japan withdrew the additional troops sent into the Railway Zone and in other ways indicated that the intervention was a defensive measure and had no relationship to politics.

To students of things Chinese, the most remarkable fact of the intervention was the failure of any large body of Chinese to protest against it. A few students in Shanghai raised a weak voice against the additional Japanese troops in the Railway Zone, but little attention was paid to their protests by the articulate masses of the Chinese people. None of the large and important public organizations passed resolutions or sent lengthy telegrams on the subject. Tacitly, it was passed over as something which was to be expected and which, in a large measure, was right. At any rate, the private comment among Chinese was that Manchuria had been saved from the fate of Honan and Shantung and Chihli and those provinces which for fourteen years have become economically stagnant because each year the farmers are driven from the lands and the crops destroyed by the mercenary hordes of the feudal lords. Manchuria was saved from this by a temporary intervention and by an expeditious handling of the railway situation by the administration of the South Manchuria Railway. The fact that Marshal Chang Tso-lin was successful has little bearing on the situation, for among the Japanese living in Manchuria there is a strong party which is unfriendly to Marshal Chang and the Japanese press was not altogether unfavorably disposed to General Kuo. It was not the personalities which mattered in this instance, but the principle and the principle was that there should be no fighting in the Railway Zone of Manchuria and that there should be no using of the railways for the transportation of troops, and that the rolling stock and equipment of the lines should not be destroyed by the mercenaries. It is important to note that the Chinese Eastern Railway, which is under Russian management, agreed with the Japanese point of view and adopted the same attitude. Ambassador Kopp in Tokyo made a statement to the Japanese Foreign Office which clarified the atmosphere and indicated that Soviet Russia would not utilize the Manchurian situation for the disturbance of the friendly relations between Japan and Soviet Russia and for intrigues against Japan which was taking defensive measures for the safeguarding of her economic interests in Manchuria.

So much for that phase of the questions. Now, arises the analogy between the situation in Manchuria and the situation in China proper. By the Protocol of 1901, which ended the Boxer Rebellion, the Chinese Government agreed to keep the railway between Peking and the sea always open for the egress of the foreign legations from Peking. The Treaty Powers maintain troops at Tientsin and other places along the Peking-Mukden line for the purpose of keeping the railway open that the ministers and other servants of the foreign governments might not be bottled up in the Legation Quarter in the event of danger to their lives and their national interests in Peking. During the war of 1924, the Chinese Government was not in a position to keep the railway line open and was forced to agree to the despatch of an International Train under a guard from the foreign regiments stationed along the line. This train bore the flags of all the Treaty Powers on the locomotives and was given the right of way by the contending parties. During the war of 1925, the device of an International Train was again resorted to. The foreign expeditionary troops to China again manned the train. Again the Chinese Government was unable to live up to the terms of the Protocol of 1901. **But this time, the contending troops did not give the International Train the right of way. It was fired upon and driven back and for days it lay in the station waiting for a chance to proceed. And the remarkable thing about it all is that the Legations did nothing, except as the story goes, one suggestion was made that the locomotive be painted white and a white flag be flown to indicate to China and the world the cowardice of the Legations and the bankruptcy of foreign policy in China.**

These two examples, that in Manchuria and that of the International Train, explain the difference between the conduct of Japan in China and that of the other foreign Powers. Japan to maintain her safety acted expeditiously and without harm to China and saved Manchuria; the other Powers talked a great deal about their rights, did nothing, created confusion and ultimately hurt China, for it is not to the interest of China that the railways should be closed any more than it is to the interests of the foreigners and if there is any way of intervening in such a situation without political impairment to China, it should be done. There is no political impairment to China as a result of the Japanese intervention in Manchuria—yet much good has been accomplished.

In the handling of international problems during an actual engagement in a civil war, the Chinese have developed the technique of suggesting to the world that the civil wars are nothing more than general elections in other countries and that foreign interference at any point is an indication of partisanship and meddling in the internal affairs of the country. For it is only natural that because of the time element and the geographic factors in such intervention a slight benefit should be afforded one side or the other, even if such benefits are entirely accidental and unpremeditated. The argument is so sound that most of the foreign Powers having interests in China seek most punctiliously to keep aloof from any inteference in these situations. They have no desire to help one militarist against another in the exploitation of the Chinese people, for after all, that is the entire function of the feudal lords. The foreign Powers would rather sacrifice their own interests and their own rights than earn the ill-will of the Chinese people through such interferences. They would rather risk a temporary setback to their trade interests than to involve themselves in possible boycotts and similar antagonistic movements. Nobody is courting trouble in China, which during this transitional period, is liable to react in the queerest manner even to the most friendly advances of foreign Powers. Nevertheless, Japan's interests in Manchuria, which are more economic than political and upon which the future and the life of Japan as a nation depends, must be recognized. It is not that Japan fears the outcome of a war between Marshal Chang and General Kuo. It is not that Japan is opposed to all change in Manchuria. It is not that Japan seeks to set up a hegemony in Manchuria. It is rather that Japan fears the complete breakdown of economic life and political control in the Three Eastern Provinces because of this internecene strife with the result that other Powers and other interests might utilize this vast and rich territory to the confusion of Asia and the detriment of the world. Since 1905, Japan has prevented such an eventuality in Manchuria at great costs and risks to herself and practically unaided by the other Powers. In fact, for a long time there was a tendency even among friendly nations to questions Japan's motives in Manchuria and to place obstacles in the way of Japan's policy in that part of China. That day is, however, over. The Powers realize that Manchuria is the buffer between order and chaos in Asia and that Japan is the guardian of the buffer. As long as Japan prevents further infiltration of the forces of disorder into Manchuria, so long will there be prosperity and peace in that part of China and so long will there be a Great Wall to protect China against those forces. The moment Japan is forced by China or the Powers to relinquish this position, then all will be lost in Manchuria and the Three Eastern Provinces will follow the example of Canton and the Yellow River Valley.

There is no suggestion in this comment that China should forego her rights to Manchuria or that Japan should occupy the Three Eastern Provinces. Such a step would be foolhardy and would lead to frightful complications in China and perhaps to a serious war in the Pacific. Japan has apparently no such intentions. One simply has to recognize that China, in this transitional period from which it is to be hoped, she will soon arise, is likely to be a prey to every predatory and disorderly force and that whenever it is possible to help China by restricting the area of operation of these forces, it is to the advantage of China and the peace of the world. If Japan does little more than that she has earned her privileged position in Asia.

The New York Chamber of Commerce Protests Against American Sentimentalism

An Able and Adequate Survey of Conditions in China without an Impairment of the Traditional American Friendship

THE Chamber of Commerce of the State of New York, undoubtedly the most powerful commercial organization in the United States, representing as it does the heart of the economic life of that country, has passed a resolution with regard to China which is of such importance that it counteracts in all respects much of the piffle with regard to this situation which has been appearing in the American press. No American wants a continuation indefinitely of the extraordinary conditions under which foreigners live and trade in China. No American wants to have special rights and privileges anywhere in the world. It is not part of the game. It is not part of the American character. But Americans on the other hand, dislike seeing themselves constantly done in the eye, as the expression goes. The resolutions passed by the Chamber of Commerce of New York State make that point so clear and we therefore give them in full :

> The condition of affairs now existing and that have existed for some time past in China challenges the attention of the world, not only because it disastrously affects the Chinese people but because it vitally affects international relationships, world commerce and economic conditions.
>
> A semblance of diplomatic relations with China has been maintained, although for several years there has been only the form rather than the substance of a national government there, and diplomatic representatives of other nations have been sent to a place where national Central Government formerly existed by where such in fact does not now exist, having been disrupted by the conflicts of military Governors of various provinces who have seized arbitary power over large sections of the country and in effect have created insurrection and civil war.
>
> To-day portions of the Chinese people, apparently with the approval of the semblance of Government at Peking, are demanding the revision or abrogation of existing treaties which secure to foreigners the right to the protection of life and property under the laws of their own countries and demand also tariff autonomy and the administration of their customs receipts which have been pledged as security for loans made to China by other nations.
>
> The treaties now sought to be amended or denounced were negotiated to meet actual needs and are more necessary under the conditions existing to-day than at any time since the establishment of extraterritorial rights.
>
> When China has established a national Central Government commanding the allegiance, confidence and respect of its own people, with power to protect foreigners within its borders and to administer justice under an established code of laws, it is not to be doubted that the nations will then agree to revise present treaties and to meet the reasonable views of such a responsible Government.
>
> In the absence of such competent protection it is unthinkable that the present safeguards should be surrendered and this declaration applies equally to the established grant of extraterritorial rights and to the foreign administration of the Customs Service.
>
> China is an enormous country possessing a heritage of ancient traditions and civilization of great repute and millions of people capable of developing a great future. Its potential wealth and power are of enormous importance to the rest of the world.
>
> It is, therefore, a matter of profound concern to other nations that a condition of dissension and disrupted government exists which jeopardizes vital interests of other friendly nations and prevents a development in China of which both the country and its people are capable.
>
> Whereas, The United States have always held an attitude of friendship toward China, and have given frequent evidence by friendly acts of a sincere desire to be of assistance to that great nation ; and
>
> Whereas, The friends of the Chinese people look forward to the day when that people shall establish a national government which they will support and whose authority they will recognize, and thereby may take their place in the family of nations on terms of unquestioned independence; therefore, be it.
>
> Resolved, That it is the opinion of the Chamber of Commerce of the State of New York that the present International Conference at Peking, and others that may follow, offer a great opportunity for constructive service on the part of the United States to the Chinese people ; and, be it further
>
> Resolved, That it is the opinion of the Chamber of Commerce of the State of New York that Chinese interests will be served best and order more quickly restored by the maintenance intact of all covenants now in force until the people of China have demonstrated their ability to establish and sustain peace in

their country, justice in their courts and to afford adequate protection to foreign residents ; and, be it further

Resolved, That the President of the Chamber and the Executive Committee be and they are hereby authorized and directed to take such steps as may be deemed most expedient to lay this report and recommendation of the Chamber before the President of the United States, the Secretary of State, the Congress, and to take such other action as may be deemed advisable.

It is often difficult to make the Chinese realize that opposition in any particular to the present program of the Chinese people for national equality is not opposition to the Chinese people or to China's ultimate achievement of her goal. There is just a question in the minds of many of China's best friends whether any advantage can accrue to China from the unsettlement of political and economic relationships at a time when there is not even the semblance of government and when the country is further from stabilization than at any period during the past century. Take for instance the political condition of the country at this moment : there is no constitution. Whatever calls itself a government is functioning without any basic law. There is no President. There is a Regent who has desired to resign since October 10 but who dares not go, fearing the wrath of the militarists. He now declares that he will leave on January 15, but it is impossible to find a successor for him. There is only part of a Cabinet and that has no sanction from any representative elements in the country. The Chinese delegation to the Tariff Conference has been pared down to a few men because those originally appointed are now political refugees and dare not remain in the capital. Of the 22 provinces of the country, not more than five or six recognize the existence of Peking and none of them recognize its authority. With whom then are the Powers negotiating on these momentous questions ? Whom do the Chinese delegates represent ? What is the importance of the representatives ? How can the Powers be certain that decisions reached and treaties signed will have the cognizance and approval of the feudal lords in the provinces, who really control the country and have the final voice in administrative conduct ?

Nor is there a suggestion in this criticism that conditions will always be so. Other nations have had their difficult periods and have been forced to bide their time until internal reconstruction justified a rearrangement of international relationships. The suggestion of many Chinese that conditions in China are foul because of China's international relations is false. For the wealth of the country, the resources and financial income, are being frittered away by the feudal lords in the interminable struggle for personal aggrandizement and position. Where are the 60-80 millions a year—collected every year for likin alone ? What becomes of the land tax ? What becomes of the income of the railroads ? What becomes of the money borrowed on domestically issued bonds and treasury notes ? In a word, China collects enough revenue every year to more than cover its normal expenditures and to provide sufficient funds for the achievement of unity and the commencement of an era of reconstruction but every dollar of it is frittered away and purloined by these military adventurers, who are greater enemies to the country than the most predatory of foreign nations.

If the Chinese people would use the force which is released in popular demonstrations against foreigners on every occasion when there is dissatisfaction with the conduct of a foreign Power—if this force were used to create a will to unity and stabilization, there will be an end to disorders and an end to the extraordinary position of the foreigner in China. If the masses of the Chinese people would discountenance corruption and the purloining of public funds, there would be enough money in the country to start upon a program of reconstruction which would make China one of the greatest nations on the face of the earth. But that day has apparently not yet come and until it does come, is it not dangerous to interfere with the only agencies in the country which are functioning adequately and which are under supervision. The abolition of extraterritoriality is inevitable in China, as it places this country in umbrage in comparison with other nations, but is this the time to accomplish such a tremendous reorganization of the life and law of this country. The return of Settlements and Concessions is inevitable, but shall the millions in property in the cities of Shanghai, Tientsin and Hankow be placed in jeopardy at a time when the Chinese government cannot create the agencies to provide governments for these places as efficient and as competent as those now functioning ? What benefits will it be to China to have the empty shell of the success of a policy if with it goes economic disorganization ?

An End to Malicious Propaganda!

AMBASSADOR Matsudaira's address before the American Academy of Political and Social Sciences, should be taken most seriously by the newspapers of the United States and Japan. In a brilliant statement of the relationships between the two countries, the Japanese Ambassador deprecates the utilization of press propaganda for the swinging of public opinion into a atmosphere of hatred and distrust. He points succinctly to the historical friendship between the United States and Japan and clearly indicates that at no point do the interests and aspirations of the two countries conflict. Why then should there be distrust ? It is one of the most unfortunate concomitants of liberty that every man may express his opinions, whether he knows anything about the subject or not. We have on several occasions reprinted items from Mr. Brisbane's writings to show how he had been misled as to facts and that his theories about Far Eastern affairs were based upon fanciful data. Other American writers and publishers suffer in the same way. There was a time when it was popular in the United States to oppose everything Japanese and a cult of anti-Japonism came into existence which seriousy endangered the friendly relations between the two countries. That time is fortunately passed ; yet some of the old fogies cling to old ideas because they do not understand changing conditions. Mr. Matsudaira's address may wake them up. If it does not, there is no hope for them. We quote the essential parts of his speech :

"Democracy puts a great responsibility upon the shoulders of the people in the conduct of international affairs," he said. "Unless the people take this new responsibility seriously to heart and endeavor to play their part honorably and wisely the demoratic conduct of diplomacy cannot be free from its peculiar blemishes and shortcomings. To overcome ignorance with knowledge and to supplant misunderstanding with truth is incumbent upon us.

"The danger of democratic control of foreign relations rests mainly in a popular misunderstanding of the general conditions and the viewpoints of other nations. Misunderstanding often breeds suspicion and suspicion begets harred, doing harm in the relations of nations. So long as there is popular misunderstanding the people are likely to full an easy prey to propaganda.

"We have seen in various publications recently brought to light that during the great war misleading propaganda was extensively conducted on both sides of the armed camp," he continued. "It was manipulated so skillfully and so clandestinely that the people, given to excitement and resentment caused by that struggle, readily accepted what was said and done with the deliberate purpose of misleading them.

"It is unfortunately the case that propaganda is carried on in time of peace as well as war, and often impairs the relations of nations which have no real reason for any feeling toward each other than of confidence and freindship.

"These observations, it seems to me, have a particular significance in the case of American-Japanese relations. Efforts have been made from time to time, and with different purposes in veiw, to lead the people of one side to distrust those of the other. Such activities are badly to be deplored. *Between our countries there is no reason or excuse for distrust. We have long been friends, for more than seventy years, and none of our important interests, policies or inclinations can seriously conflict.* It is therefore to be hoped that earnest endeavors will be put forth on both sides to cultivate the fullest measure of good understanding and mutual confidence on the part of each of us."

At the outset the Japanese Ambassador deliberately turned his back upon that menacing shibboleth of the alarmists, "the problem of the Pacific," with the declaration that "the United States and Japan are both fortunate at the present time in the fact that there is no issue in international relations which is likely to require from either of them a settlement beyond the ordinary scope and ability of diplomacy."

The Shipping, Engineering and Machinery Exhibition in London, 1925

ALTHOUGH primarily of importance to technical men, the Shipping, Engineering and Machinery Exhibition recently held in London contained much of considerable interest to the general public. The exhibits staged by the big shipping companies and railway groups always attract visitors, probably by reason of the cleverly constructed models which are so frequently used. There are few people with the slightest interest in machinery who can refrain, for example, from a close inspection of a large scale model of one of the world's most important ports, complete with docks, shipping and railway system. The educational value of such an exhibit is very considerable.

At Olympia a great deal of interest was displayed in the latest automatic devices for keeping ships on their set courses, thus relieving the helmsman of a considerable amount of anxiety and labor. For those unfortunate people to whom a heavy sea means illness and misery, a working model of a gyroscopic stabiliser was a centre of attraction. In this exhibit the vessel was rolled violently by mechanical means and, when the roll had reached an appreciable amount, the stabiliser was put into operation, and it was demonstrated how the roll was quenched.

Safety at Sea

An exhibit which emphasised the sterner side of sea life was that of the B.S.A. line throwing gun, which was designed primarily for throwing a line at sea where distances are too great to admit of the use of a heaving line. This gun has proved invaluable for establishing communication between a lifeboat and a wreck, and in other similar circumstances. The cost per shot is no more than the price of an ordinary rifle cartridge, and yet a $\frac{1}{16}$ inch or $\frac{3}{16}$ inch line can be thrown with accuracy and certainty even in rough weather.

In rough weather at sea visibility is frequently greatly reduced by the spray, rain or snow, which covers the windows of the navigating bridge. The device known as Kent's clear view screen completely gets over this difficulty, as was clearly shown by means of a working model at the Exhibition. By rotating a circular disc of the window glass, at a very high speed by means of an electric motor, all moisture is thrown off, leaving an unobstructed view. This clever device has been adopted by a large number of the leading lines.

With the rapidly increasing use of oil fuels at sea, the question of oil purification has become of paramount importance. The range of De Laval oil purifiers shown by Chadburn's (Ship) Telegraph Co., came in for particular attention, as the number of this type in use is said to exceed by four times those of all other manufacture combined. An immense machine known as the De Laval marine type 900, the largest centrifugal oil purifier in the world and capable of handling over six tons per hour, was on view. This has been specially designed to keep pace with the rapid advance of Diesel marine engine development. The "Fumeless" system eliminates all the dangers of treating fuel oils, and has now passed the Board of Trade regulations.

Another working exhibit on the same stand was a demonstration plant showing the separation of two liquids in continuous operation.

Scientific Instruments and Recorders

The latest developments in scientific instruments were inspected with very considerable interest by visitors to the Exhibition. Some of these instruments were directly applicable to navigation or marine engineering as, for example, the Kelvin stability and ship's draught indicator, the "Kelvite" sounding machines, and a new type of heating and ventilating unit for ship's cabins.

Other exhibits in this class were of wider appeal. George Kent Limited, who for years have specialised in the manufacture of meters for water, steam, air and gas, were showing a new rotary steam meter for mains of three-quarter inch to two inch diameter. Small mains such as these have not previously been metered owing to the comparatively high cost of the meters hitherto available. The Telerecorder, for providing records at a distance by electric transmission, was another new instrument being shown to the public for the first time.

In a totally different sphere the Hollerith electrical tabulating and sorting machines attracted a great deal of attention. These marvellous "electrical brains" deal with facts which are represented by holes punched in cards. The Printing and Listing Tabulator will convert the holes back into legible figures at the rate of 150 cards per minute. This means that, with a Five-Counter machine, such as was exhibited, actually 750 items are being added per minute. In addition, the machine will print the tabulated results on forms. The value of this system for obtaining accurate analyses of labor costs, job costs, purchases, issues, sales and such-like, is at once obvious.

Electric Arc Welding Practice

Electric arc welding has made such a tremendous advance in recent times that its employment is spreading continuously, and to-day it is used very extensively in railway and tramway work, shipbuilding, ship repairing, general engineering and constructional work. A most instructive exhibit was staged at Olympia by Alloy Welding Processes Ltd., who specialise in the use of Flux-coated electrodes. In all their electrodes the metals to form an alloy are part of the flux coating, the core being of mild steel. In the fusing of the electrode in the arc, the various metals are alloyed, but with a total absence of porosity, and it is only by this method that successful results in the welding of alloy steels can be accomplished. The flux coating of A.W.P. electrodes is of a basic nature and, in addition to protecting the deposited metal against oxidation, will eliminate a proportion of the sulphur and phosphorous present in the electrode. These electrodes have, in general, a special winding of asbestos yarn as the basis of the covering. Asbestos is a valuable flux in itself as it fuses, and combines with iron oxide into a compound silicate which is very light and mobile, and is easily removed after solidification, leaving a clean surface.

As a result of much experience this firm's practice is to use for the metal of the electrode a standard mild steel, and to put upon this standard ore a covering which will by its action as a flux, impart to the weld metal those ingredients which are necessary to make it match the work material. In other words, for welding iron and steels, the A.W.P. practice consists in adapting the composition of the flux covering as opposed to the composition of the metal electrode itself.

Metal Like Silver and Strong as Steel

A product known as Monel Metal was shown by the well-known firm of pump makers, G. & J. Weir Ltd., of Glasgow. This consists of approximately 67 per cent. nickel, 28 per cent. copper and 5 per cent. other metals. It is a natural alloy, inasmuch as it is made directly from the ore without separating the constituent metals. In appearance similar to pure nickel, Monel Metal possesses high degrees of resistance to corrosion combined with the strength of steel. For use in contact with superheated steam, high temperatures, acids, salt water, and so on, it has proved highly successful. It is easily kept clean with soap and water, and is therefore particularly suitable for use in kitchens and hospitals. Some of the latest kitchen cars on the British railways employ this metal largely, and similar equipment has been adopted on the most up-to-date transatlantic liners.

One of the exhibits on this stand consisted of a section of Monel mosquito netting, as supplied to some of the hospitals on the Gold Coast, where the extreme humidity and effects of salt water rendered other metals unhygienic and generally unsatisfactory. The ore is found in Canada.

A Continuously Variable Transmission Gear

To turn now to the machinery exhibits, the new Hele-Shaw Beacham Transmission, which is being manufactured by Harper, Sons & Bean Ltd., was shown actually at work as applied to a large power press and an electric winch.

The employment of oil for variable transmission is one of the great advances of mechanical science. In its latest form the Hele-Shaw Beacham transmission gear consists of a pump with a variable stroke and a constant stroke hydraulic motor. The pump is coupled directly to some prime mover, and supplies the oil by which the motor is driven. By varying the stroke of the pump, the oil pressure can be increased almost indefinitely, and the torque on the driving shaft is correspondingly increased. Further, the gear is reversible as well as being continuously variable.

This new transmission has already been employed for lifting cupola domes, deck winches of ships, and, in addition to steering gears, gun mountings, tipping wagons and other purposes for which hydraulic transmission is already applied, designs have been prepared for applying the principle to a large Diesel-engined locomotive.

A Useful Tiering Truck

Among the well-known range of electrical industrial trucks and runabout cranes on the stand of Ransomes, Sims & Jefferies Ltd., was a new type of "Orwell" electric tiering truck. In this truck the platform is raised or lowered by electric power derived from storage batteries, and has a load capacity of two tons. The actual lift obtained is 4 feet 1 inch, the platform, when in its lowest position, being one foot from the ground level. It is interesting to note that, when loaded, the operation of lowering the platform has a regenerative effect of 12 amps. on the battery; also this action acts as a brake. Four-wheel steering is provided so that the truck is particularly handy to control in confined spaces.

* * *

Toll-Bridge Possibilities in Tientsin and in China

(CONTRIBUTED)

EVERYBODY is familiar with investments in securities like cotton-mills, coal-mines, gold-mines, railways, steamship companies, etc., but till now the general public knows nothing or practically nothing on investment possibilities in bridges considered as profitable commercial business.

It is generally agreed that everybody must pay for things he uses: for railway transport, for tramway and ferryboat tickets, etc., but strange to say, if the bridge—shall it be a railway or highway structure—is built, everybody's opinion is that an expensive structure, costing sometimes thousands, hundreds or even millions of dollars, must be considered as collective property and be given on disposal of their users without any direct charge.

This is the reason that there are plenty of bridges, with complete economical failure, and at the same time many river or harbor crossings without bridges and with plenty of ferryboats or even small boats—practically never sufficient to meet the requirements of people anxious to cross rapidly and with awaiting delays the waterways separating the crowded cities from their suburbs or neighbor cities.

We consider that the new era of bridges is approaching, when all crossings really required will be realized by the Toll-Bridge system—permitting to build bridges considered as business paying their own expenses for building and maintenance. In U.S. there are plenty of concerns organized on these lines—and in nearest to Far-East San-Francisco there are now two big highway bridges under construction:

1. The Antioch Bridge
2. The Carquinez Bridge

Promoted both by the American Toll Bridge Co., and by the man of vision—who is President of this Company—Mr. Aven J. Hanford.

The first bridge connecting the Bay Cities of Berkeley, Oakland, etc., with the capital of California, Sacramento, is practically finished and will be inaugurated in December this year or early in January, 1926.

The second bridge, the Carquinez highway Bridge, will be ready for 1927 and will be an important link between Bay Cities and North California.

There is also proposed a third bridge in San-Francisco which will connect the 16th Avenue of San-Francisco with the Alameda Country this bridge will be shortly built also by the same Toll-Bridge Co., to facilitate the access directly from San-Francisco to Sacramento and to North California through the two above mentioned Antioch and Carquinez bridges. In this way the third proposed toll-bridge in San-Francisco will rise the commercial value of the two above mentioned bridges.

Till now all Toll-Bridge Companies are using the invested money of their shareholders for building new bridges and as generally it takes much time to realize a big bridge, the general public—anxious to see their invested capital giving immediate returns as interest, is not likely to be much interested in investing his economies in toll-bridge enterprises.

This is the principal reason, on our opinion, that the Toll-Bridge Companies are till now much less popular than they deserve.

We think that at Tientsin there is an exceptional possibility of realizing the Toll-Bridge Chinese Company on quite new lines.

The new "Chin Kan Chiao" Bridge over Pei-Ho is completed and was turned over to the Chinese Authorities on last Sunday, the 13th December.

The heavy traffic of rickshaws, say about of 10,000 daily—of Chinese Carts, of about 1,000 daily and of practically 800 motor cars and motor lorries, with about 10,000 pedestrians crossing every day this new bridge, without taking in consideration the passengers of the tramway line, which will be certainly opened through this new bridge and even without taking in consideration the possible toll from Chinese boats crossing the bridge (the central span of this bridge is of bascule type consisting of two-leaf Scherzer's system span) can be easily turned over in a very profitable Toll-Bridge of Tientsin.

The supplementary license paid by rickshaws, native carts, motorcars and lorries can easily give a receipt of say minimum 60,000—70,000 pollars per year.

Rickshaw-pullers and owners of native carts, of motor cars and lorry will and shall pay to the Toll Bridge Company for services this new bridge will them render.

The collection of all these licenses will not disturb neither stop the traffic as our proposal is to have special "Toll Bridge" license, like the special circulation permit for the Chinese Native City of Tientsin.

We do not propose to collect a toll from pedestrians crossing the bridge, but it is quite possible if necessary, to arrange special hours "free of charge," say early in the morning and late in the evening when the bridge can be used by pedestrians without any charge.

During business hours or say during 3-4 hours everyday it is possible, if required, collect small tax, say 2 coppers, like the fee paid by people for crossing the river by boats.

The receipts of the Toll-Bridge Co., especially organized for this bridge can be used by the Authorities for building new bridges in Tientsin, say in first line for rebuilding of the Red Bridge demolished by the flood of last year.

The second Toll-Bridge to be realized in Tientsin can be the old International Bridge which may be easily transformed after the dismantling only of the center pier in a special heavy traffic bridge connecting the French Concession with the East-Station.

The new International Bridge will be in 5-6 years after its completion expected only in 1927, not sufficient tc meet the steady growing traffic and we suggest to transform the existing bridge in the above mentioned way providing for the central span a new lift span of Dr. Waddell's system but much narrower than the existing draw-span for the purpose of using the old flanking piers without any reinforcement.

It is also possible, instead of a lift-span propose for this new big central span of the old bridge, a special system of " Pont Transbordeur " like existing bridges of this type at Marseilles, Rouen, etc., if the River Authorities will find objectionable to have two permanent structures with movable spans too close one from the other.

There are also other possibilities at Tientsin for the Toll-Bridges: upstream of the existing International Bridge, the Austrian Bridge and downstream one bridge between the ex-Russian and ex-German Concession to give opportunity of extension of Tientsin of the other site of Hai-Ho and to rise the value of the land of the Ex-Russian Concession.

It seems also possible to build a Toll-Bridge between the Belgian Concession and the ex-German Concession to rise also the value of the land of Belgian Concession and of all lots of the land on the left site of the river.

This proposed Belgian Bridge can at the same time give an excellent opportunity for the motorcars of Tientsin to have a nice drive round the country and in this way it can be considered that every motorcar owner at Tientsin will apply for the special toll-bridge license authorizing him to cross this bridge.

The last two bridges: the Russian and the Belgian Bridges can be realized as lift-bridge with one big span covering the 300-ft. of Hai-Ho as proposed last year by one firm for the new International Bridges. Besides Tientsin there are other possibilities for Toll Bridges in China, say:

1. at Canton for the new Canton Harbour Pearl River Bridge
2. at Shanghai for the bridge connecting Shanghai with Pootung district
3. at Hankow (railway and highway bridge)—across Yantze and Han River.
4. at Chengchow for the Yellow River crossing—if the special Yellow River, Toll Bridge Co., will receive authority to collect during say 25-30 years a special toll say 0.50 M. from every ton of goods and say 0.50 M. from every passenger crossing the bridge
5. at Kalgan for the new bridge to be rebuilt in place of the bridge recently demolished by the flood, etc.

We hope that this our suggestion will help China to realize bridges waiting since longtime sufficient money not so easy obtainable if these bridges are to be realized by the old system of spending money in building bridges without requiring people using them to pay for.

* * *

Industrial Progress of China

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CHINA, though yet a nation of handicrafts, during the last decade has witnessed marked progress in the development of more modern industrial enterprises within its borders. With the outbreak of the World War many commodities which China formerly secured from Europe could not be obtained, and, in consequence, factories were established in various parts of the country. Many of these factories are capitalized by British, German, and Japanese interests, and exist in or near the foreign-protected treaty ports. Their success in the production of foreign-type articles for home consumption gave much encouragement to the expansion of manufacturing along western lines, until to-day manufactured goods of modern type are even beginning to find markets abroad. In 1912 the value of factory products exported from China amounted to 3,724,813 haikwan taels. In 1924 it totaled 18,810,291.

Shanghai, the outstanding port and commercial city, is also the center of industrial development, although much progress has been made in some other districts. This is largely due to the gravitation of Chinese capital to this largest of the foreign settlements, for protection against heavy taxation by the Chinese military authorities in the interior. There is no portion of the country which does not contribute some share to the trade of Shanghai, nor to which Shanghai's manufactured goods do not to some extent penetrate. The Shanghai district, moreover, is rich in natural resources, and, in addition to its supreme facilities for sea-borne trade, possesses the advantages of adequate interior transportation and an abundant supply of labor.

Electrical Expansion Indicates Industrial Progress

A good illustration of the industrial progress that has been taking place in recent years is the expansion of electric lighting and power plants. Prior to 1910 the use of electricity industrially in China was in an embryonic stage. To-day there are electric-power plants in Shanghai, Tientsin, Harbin, Hongkong, Hankow, Canton, and the other large cities, and the number of electric power and lighting plants combined in China is estimated at nearly 400. There are few towns of any importance that do not have a lighting plant.

Modern Machinery Used in Chinese Textile Establishments

The greatest progress has been made in the textile industry, especially in cotton spinning and weaving. This industry is more than half controlled by British and Japanese interests in China. Chinese cotton goods are slowly gaining favor at the expense of the more costly foreign weaves. Chinese piece goods manufactured in Japanese-owned mills are being exported to Hongkong for South Africa and other countries to which they are suited. In 1924 the number of spindles in China was estimated at more than 3,000,000, as compared with 1,619,000 in 1919. The number of looms has increased from 13,403 in 1923 to 15,000 in 1924. China is a very large producer of raw cotton, and a large consumer of cotton yarn and piece goods as well. These facts have caused large amounts of foreign capital to be invested in the development of the cotton-weaving industry. Prior to the World War most of the textile machinery came from Great Britain, but with England's factories engaged in the manufacture of ammunitions and war supplies American firms were offered an opportunity to participate in the trade. Machinery of the most modern type now finds an expanding market in the equipment of Chinese textile plants.

One of the oldest of all Chinese industries is that of the cultivation and production of silk, but its development has been handicapped by indifference to scientific methods of culture and production. The Japanese, owing to their readiness to adopt modern methods, long since usurped China's place as the leading silk-exporting country of the world, but in recent years some new methods and a good many improvements in the old ones have been introduced in China. Silk filatures and weaving plants of modern character are found in Canton, Shanghai, Hangchow, Soochow, Hankow and Chefoo. In 1923 it was estimated that there were approximately 225 steam filatures in the country.

Most Flour Mills Equipped with American Machinery

The increase in the number of modern flour mills is an interesting phenomenon of the industrialization of China. Harbin alone has 34 flour mills, with a capacity of 300,000 tons per year. In 1924 there were 160 mills throught the country, with a daily capacity of about 270,000 fifty-pound bags. These mills are modern in type and equipped in most instances with American machinery. Harbin, in Manchuria, is the leading mill center for Manchurian and Siberian wheat. Shanghai is the flour-manufacturing center of China proper, because of its proximity to the vast wheat-producing areas of the Yangtze Valley. Other important centers of the industry are Tsinan, Tientsin, Wusih and Dairen.

Important Shipbuilding Industry Being Developed

The demand for tonnage to replace the destruction of merchant ships during the World War gave impetus to modern shipbuilding in China. Hongkong, Shanghai, Canton, Dairen, in fact, all the principal ports, are developing an important shipbuilding industry. In 1924 there were 53 major companies, mostly foreign controlled, engaged in the business, with Shanghai as the leading center. These firms recently have been turning out large ocean-going vessels, not only for use at home but also in foreign countries

Bean-Oil Factories Meeting Increased Export Demand

Bean oil has long been used in China as a substitute for butter and animal fats, and bean cake as a food for livestock. Only in comparatively recent years, however, has the great demand for these products abroad, especially in Japan, developed an important export trade. The modern industry is largely under Japanese control at Dairen. In the old days of domestic use there were thousands of bean-oil mills worked by hand, or by the patient donkey, all over China, but with the development of a large volume of export trade these proved totally inadequate and modern factories equipped with up-to-date machinery, had to be built to take their place. There were 56 of these mills in Manchuria alone in 1922, and the total number throughout China at the present time is probably several times that figure.

Iron foundries, collieries, and machine shops are usually large enterprises, mostly in the hands of foreigners, or developed by foreign capital, and their expansion depends to a great extent upon the development of railways. Other industries that are expanding with less intimate relation to railway activities are sawmills, completely equipped with dry kilns and modern machinery; cement plants; sugar refineries; distilleries for the production of alcohol; and tanning, canning, and tobacco factories—most of which have been established within the last 10 years.

China's greatest resource, by long odds, is its man power. No country has so vast a population so thoroughly habituated to industry. This man power creates a great domestic market for China's industrial products, but without foreign capital little industrial progress in China would have been made.

* * *

The Electrical Exhibition at Osaka

A GRAND electrical exhibition, which is unprecedented, not only in Japan, but also in the Far East, in points of grandness of the scale and the excellence of substance, is now under way in Osaka, Japan's water metropolis, to be opened on March 20, 1926, to last until May 31, same year, under the auspices of the Electrical Association. The Exhibition will feature the development of electrical knowledge, industrial application of electricity, and promotion of electrical enterprises.

All the commercial and industrial companies and people of Far Eastern countries, as well as those of European and American countries, have been invited to visit the exhibition and participate in it by sending their exhibits of electrical appliances and machineries under their control.

It is intended by the Exhibition authorities to give the users of electrical equipment and to the general public a better idea of the electrical industry in all its phases in Japan. To do this in the most effective manner, and to make it more instructive and interesting, it is planned that the actual methods of manufacture and operation of the article or its final use will be shown in such a way as to depict actual working conditions.

A list of machines and appliances which have been announced by the exhibition authorities as most welcome for forthcoming exhibition follow:

1. All Kinds of Prime Movers, Electric Machineries, and Models of Generator.—Water turbine and parts thereof; boilers; steam engine; steam turbin; internal conbustion engine; models of power plants and map showing their location and structure; generator; electric motor; transformer; converter; switch board and parts thereof.

2. Electric Cables.—Electric cables; pole transformer; iron towers; insulator, etc.

3. Telephone and Telegram Appliances.—Telegraphic apparatus; telegraphic typewriter; telephone; telephone switch board; automatic switch board; telephone and telegram appliances; telephotographic apparatus; electric signal.

4. Lighting Appliances and Equipment.—Electric bulbs; accumulating metre; electric lighting equipment; glass wares used in the electric lighting appliances; mercury lamp; search light and similar articles; electric light appliance in advertisement, its models and designs.

5. Electric Driven Machinery.—Industrial machinery of all types and machine tools, electrically driven or otherwise; electric cables and bulbs manufacturing outfit; electric welding apparatus; electric iron sorting apparatus; electrically driven pumps, winch, elevator, drill; transmission gears and transmission appliances; belt.

6. Insulators.—Insulating oil, paper, tape, etc.; mica; enamel; fibre; ebonite.

7. Electro-Chemical Apparatus and Products.—Nitrogen fertilizer manufacturing apparatus; carbide producers; electric tempering apparatus; electric furnace; electro-plating equipment; electro-chemical products.

8. Ship's Electric Appliances.—Electric propelling equipment; gyro-compass; stabulator; search light; batteries.

9. Electric Metre, Testing Machine.—Electric metre; electric testing machine; educational electric apparatus; electric toys.

10. Household Electric Appliances.—Electric fan; electric heater; electric sweeping apparatus; electric sewing machine; electric toilet apparatus; electric washing equipment; electric massage apparatus; electric pump; other household electric appliances.

11. Wireless Broadcasting and Receiving Equipment.—Radio broadcasting equipment and parts thereof; radio broadcasting receiving set.

12. Materials Used for Electric Machinery and Electric Cables.—Pig iron; cast steel; iron and steel plate; iron and steel cables; iron sheet; magnet steel; lead; tin; antimony; aluminium; glass; coal; oil; mining and refining equipment; other fuels.

13. Farming Machinery.—Farming machinery of all kinds, electrically driven or otherwise, and their models and designs.

14. Cooking Apparatus.—Electric driven cooking, confectionary producing, and beverage manufacturing apparatus; tables wares; utensils used in the kitchen.

15. Statistics.—Statistics; books; maps.

16. Communication and Traffic.—Electric locomotives; electric tram-car; wheel and body; break; electric signal; lighting equipment in the train; head light; models of electric railway; models of scenery surrounding any electric railway; models of cable car; Japan made automobile; airplane; electric tructor;

17. Medical Instruments.—Medical instruments of all kinds, electrically driven or otherwise.

18. Foreign Manufactures.—Foreign made machinery of all kinds, electrically driven or otherwise; automobils; electric automobiles, etc.

19. Reference Materials.—Arms' electric appliances; statistical and histrical models concerning electricity; books, papers, designs; Governmental exhibits.

The Grand Electrical Exhibition is presided over by H.I.H. Prince Kan-in, who will be helped by Viscount K. Kiyoura, ex-Premier, and Baron K. Den, ex-Minister of Communication.

The site of the exhibition extends to approximately 50 acres; it is divided into two places, the one at the harbour district, and the other on the Tennoji Park ground, both places being in the city of Osaka.

The Passenger Lifts on the New P. & O. Boats

In our article in the September number on the equipment of the new P. & O. Boats "Ranpura" and "Rawalpindi" omission was made of the fact that the lifts for the whole P. & O. post war building program consisting of 29 Electric Lifts were entrusted to Messrs. Smith, Major & Stevens, Ltd.

Iron and Steel Trade with Japan

AN iron and steel industry is a necessary adjunct to the maintenance of a modern army and navy; but for that Japan might well have been satisfied to meet her requirements from outside sources, says, the *Iron and Coal Trades Review*. She is not favored with suitable and convenient supplies of raw materials, and consequently from an economic standpoint it cannot be said that the development of an iron and steel industry in Japan itself has been a success, though developments in Korea may change the position. Before the war—and the same applies to-day—without disregarding production costs, competition in the home market with British, Continental or American products was impossible. The industry, of course, made rapid strides under the exigencies of the war, but as in most other producing countries the increased capacity outstripped requirements of normal times. Unfortunately, Japan relies almost entirely upon imported ore, principally from China, Manchuria and Chosen; the industry also is handicapped by the diminishing supply of coal. The demand for rolled steel is met only partially by Japanese works, many of which are lying idle unable to compete under present conditions. The Government works at Yawata to-day are making the bulk of the Japanese pig-iron and steel output. Whether they could continue working under private ownership and successfully meet foreign competition in the home market is extremely doubtful.

TABLE I.—*British and American Iron and Steel Exports to Japan compared during the Year Ended June 30*, 1925.

Month.	Ship plates. Tons.	Black sheets. Tons.	Black plates. Tons.	Galvd. sheets. Tons.	Tin plates. Tons.	Other iron and steel. Tons.	Total Great Britain. Tons.	Total United States. Tons.
1924.—July	72	16,957	3,500	159	3,256	916	24,860	9,305
Aug.	3	11,876	1,952	—	1,513	1,334	16,678	11,281
Sept.	331	8,293	124	379	2,090	1,666	12,883	15,545
Oct.	77	8,666	1,191	—	1,508	596	12,038	21,160
Nov.	123	6,912	1,270	49	613	1,376	10,343	29,401
Dec.	39	10,360	318	115	839	1,037	12,708	21,620
1925.—Jan.	10	12,226	324	—	1,245	1,615	15,420	22,143
Feb.	418	5,138	2	159	1,190	816	7,723	2,003
Mar.	98	1,605	7	11	1,243	2,067	5,031	5,875
April	20	687	—	63	917	1,049	2,736	14,661
May	6	1,138	251	105	2,313	463	4,276	2,784
June	—	5,873	913	16	467	1,137	8,406	*3,000
	1,197	89,731	9,852	1,056	17,194	14,072	†133,102	158,778

While in this country we are deploring the reduced volume of our iron and steel export trade, from the United States comes a complaint that Great Britain is displacing American steel manufacturers in the Japanese market. Thus a member of the United States Department of Commerce has prepared an analysis of imports of iron and steel into Japan since 1918. For the three years, 1918-1922, imports of all kinds of steel from the different countries are shown in detail, but for the years 1922-1924 the details at his disposal were less complete owing to the fact that the records were destroyed in the Japanese earthquake in 1923. He might have been able to draw a rather different conclusion from the one indicated above, had he taken the first half of 1924, or dealt with the year ended June 30, this year, as indicated in Table I, although the difference between our own and the United States' share of Japanese trade is not great.

TABLE II.—*Iron and Steel Imports from Great Britain into Japan, 1913, and 1922-24.*

Year.	Total imports. Tons.	Imports from Great Britain. Tons.	Per cent. of total.
1913...	679,590	238,070	35
1922...	1,251,385	135,660	11
1923...	1,045,877	299,582	28
1924...	1,467,616	239,372	16

The writer points out that imports from the United States fell steadily in the percentage of the total purchased by Japan, who in 1918 obtained 67.6 per cent. of her imports from America. During the two following years the percentage fell to 65.3, and in 1921 to 52.8 per cent. By 1923 the proportion of American imports purchased by Japan had been reduced to 15.4 per cent. from 41.6 in the previous year. On the other hand, it is pointed out, and of course our own statistics confirm the figures, imports by Japan from Great Britain steadily increased during the period mentioned, and received a fillip following on the Japanese earthquake in September, 1923. Our percentage of the Japanese steel trade in 1913 was about 35, but owing to the war, by 1918 it had dwindled to 2.6 only, whilst last year, as shown in Table II, after reaching about 28 per cent. in 1923, it fell to about 16 per cent. in spite of the fact that the tonnage was larger than in the last pre-war year. It is evident, having regard to the considerably larger imports into Japan during 1924—much of this probably having accumulated early in the year, being the fulfilment of orders placed after the Japanese earthquake—and the reduced share supplied by this country and the United States, that Japan is satisfying her requirements from other sources. India, of course, has been supplying her with quantities of pig-iron. whilst Continental steel now figures prominently in the import returns.

Rubber Industry and Trade of Japan

WHILE rubber products are used in every country, relatively few countries produce rubber goods. These countries may be placed in the following order of importance as consumers of crude rubber in recent years: United States, France, United Kingdom, Germany, Japan, Canada, Italy, Australia, Belgium, and Sweden. Several other countries, mostly European, have local rubber industries of some importance. Japan imported an average of 18,870 long tons of crude rubber annually in the three-year period from 1921 to 1923.

Japanese interests have fairly large investments in rubber plantations, controlling about 307,500 acres of rubber land, of which 120,700 acres were planted and 63,300 acres producing in June, 1924. This producing acreage is capable of turning out about 9,000 long tons of rubber yearly, or about half the Japanese requirements.

The Japanese rubber manufacturing industry owes its development largely to the tariff protection initiated in 1911, but was greatly aided by the cessation of imports from other rubber manufacturing countries during the war period. The products cover all classes of rubber goods, but tires, footwear, rubber toys, and specialties are the principal lines. Some important classes of Japanese rubber products, such as the "tabi" (the rubber-soled coolie shoe) and the rickshaw tire, are designed especially for use in the Orient.

In spite of the importance of the Japanese rubber industry, and the high customs duties on imported rubber products, the country imports a large quantity of automobile tires, waterproofed rubber footware, and mechanical rubber goods, the United States and Canada being the chief sources of such imports. Japanese exports of rubber products consist chiefly of tires, rubber footwear, and rubber toys, which go almost wholly to Far Eastern markets.

American tires and tubes for automobiles, trucks, and motor cycles supply about two-thirds of the market demand in Japan and encounter little competition from such articles imported from other countries. Competition with the domestically produced article may be expected to grow more severe. However, American tires and tubes give excellent satisfaction by reason of their superior wearing qualities, and there is every reason to believe that the sale of the American article will expand as the Japanese market for automotive vehicles develops.

High-class American boots and shoes, rubber-soled canvas shoes, and sport shoes in general have a good sale on the Japanese market. There is also a good demand for packing, thread, belting, hose—and, in fact, American rubber goods in general may be expected to be in demand when the best quality is desired. American rubber manufacturing companies are already well represented in this market and are in a position to watch developments and to push sales wherever practicable.

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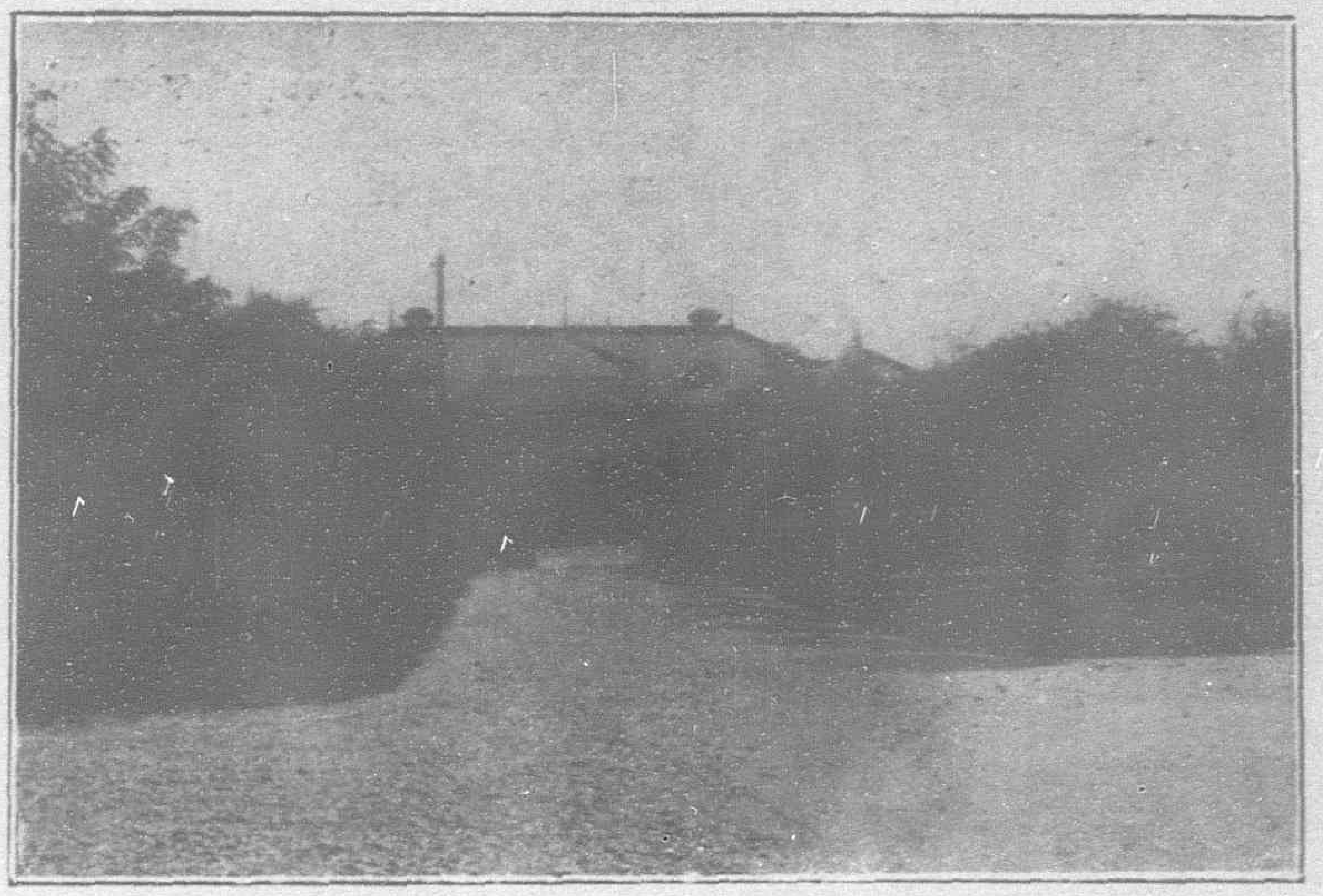
* Estimated.

† Corrected figures as supplied by the Statistical Department of the Board of Trade shows 47,339 tons as total exports to Japan from this country during six months ended June 30 and not 43,592 as indicated in monthly totals as shown.

A Logging Camp on the Yalu



Forestry reau Offices at North Pyong-an

Forestry in Korea

Under the Administration of the Government Forestry Bureau

THE forests under the administration of the Forestry Bureau extend over three provinces of Korea, namely South and North Kankyo-do (Ham-gyong) and North Heian-do (Phöng-an) and occupy a total area of 5,197,200 acres. The total accumulation of trees over the three provinces is estimated at 9,860,000,000 cubic feet, of which 6,480,000,000 cubic feet are occupied by needles, the timbers produced from them are mostly in need at present. Out of the total area, about 4,827,919 acres are woodlands and their conditions are excellent. The rest, about 392,115 acres, is still bare.

Species of trees are generally of arctic flora and such as Scarlet Pine (Beni-matsu), Ceder Pine (Sugi-matsu), Fallen Leaves Pine (Ochiba-matsu), etc., all rich in utilizable value. In the Yalu River valley, trees are mostly Scarlet Pine and Cedar Pines and in the Toman (Tumen) valley, Fallen Leaves Pine. As to the broad-leaved trees, there is not a small quantity of useful species, such as a kind of Candanor (Tan-gi) walnut and Korean Aspen, but they do not pay much at present.

Fixing the rotation at 120 years, the standard amount of trees that may be cut down annually is estimated at 46,800,000 cubic feet, but, as there are many forests in the depth of mountains from which it is not profitable to carry out timbers on account of deficient means of conveyance, the really procurable amount may be about 24,000,000 cubic feet per annum. The average amount of timbers annually obtained by the Government Works and by the sales of standing trees for the last five years was 18,559,968 cubic feet.

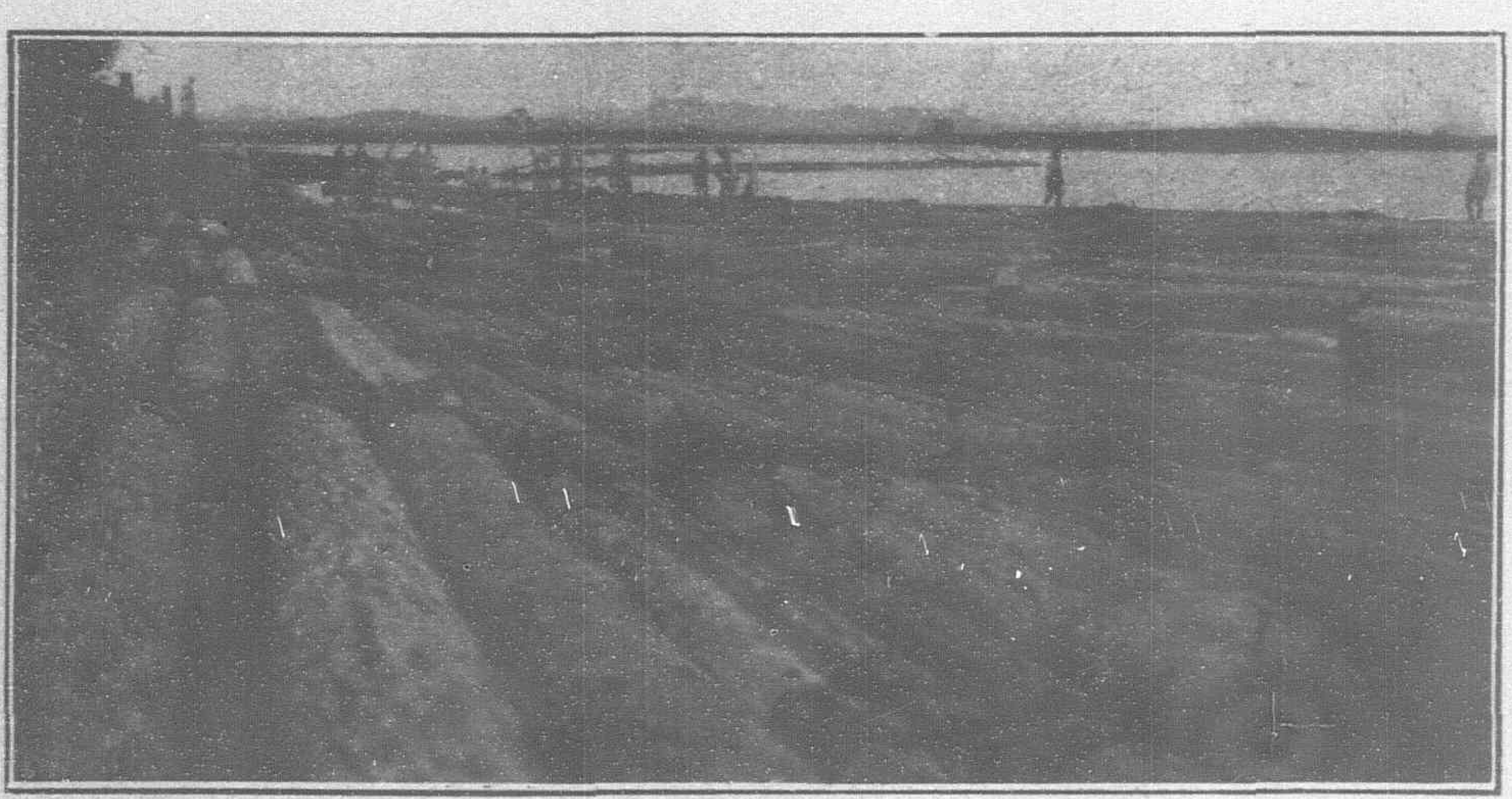
In spite of the vast dimention of forests which the Forestry Bureau possessed, there were many forests and plains for which no need of keeping them as State properties existed. Further, there were many spots which, on account of indistinctness of boundaries between the Government and private properties, caused much troubles in the administration.

To eliminate these troubles, sectional investigations were commenced in the fiscal year of 1912 and were finished in 1921, the result being as follows:

Area of Yalu River valley, 4,099,283 acres; area of Tumen River valley, 1,119,663 acres: total 5,218,946 acres.

To administer the forests properly it is necessary at first to make an investigation of the working

A Virgin Forest of Ochiba Pines—used for Sleepers and Electric Poles and Building Materials



Raft Station at Hokkado

plan, which shall be the rules for future undertakings and by that, to establish the perpetual program for the administration ; to make certain the renovation of the soil after the trees are cut down ; and at the same time, to protect the country from enemy invasions ; to provide the sources of water ; to protect the forests against damage of all kinds ; and to prepare for all other necessities, leading generally to the promotion of public welfare. This preliminary investigation is the thing that is required most fundamentally for any forest administration. But as this investigation, when intended to obtain the desirable details in full, requires a considerable amount of money and time, it was decided by the Bureau to compile first of all a simple plan for the immediate requirements and the work was commenced from the fiscal year of 1912 on those forests for which the necessity was felt most urgently. The areas of lands which have been investigated are as follows :

Yalu River valley	2,772,816 acres
Tumen River valley	571,797 acres
Total	3,344,613 acres

As above stated, out of the total area of 5,218,946 acres of forests under the administration, 3,344,613 acres have been already investigated for the working plan, but the remaining area of 1,874,333 acres are still left behind. Moreover, even the forests once investigated, are apt to change their conditions in the course of years, by natural causes and others, so that it is necessary to perform re-investigations.

Needless to say, rational administration of forests cannot be carried on without the preparatory investigations and following re-investigations as mentioned above. In the homeland, investigations of this kind being scrupulously carried out, we can see at a glance the condition of any forest in the country in full particulars and consequently, can decide the place where trees may be cut down most advantageously with perfect knowledge regarding the relation of revenue and expenditure on it.

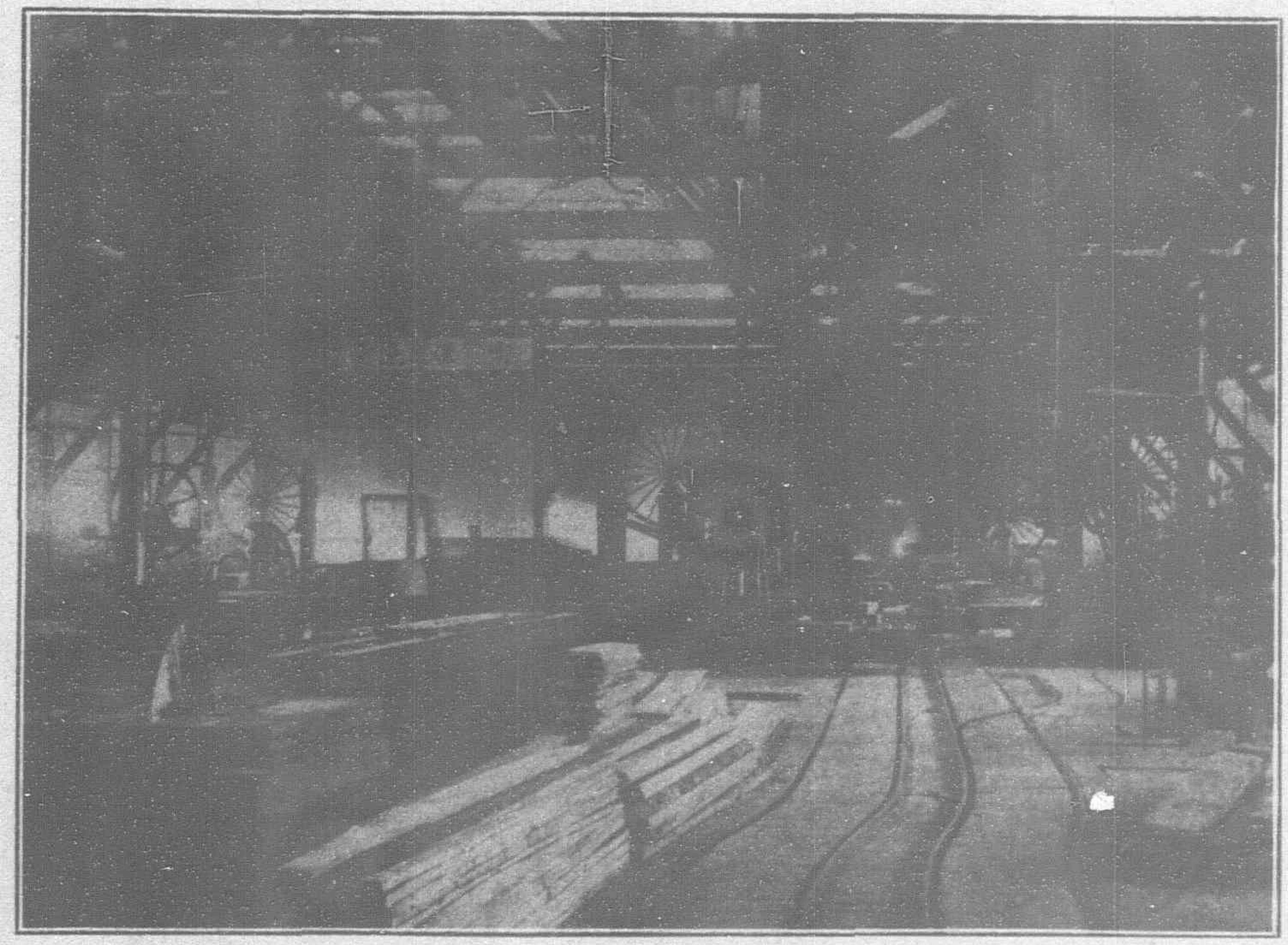
As the only five branches of the Forestry Bureau which were existing up to 1920 were too small for efficiently protecting the forests extending over 5,000,000 acres, in that year the jurisdictional area was divided into 60 districts of protection and in each district a forest ranger was appointed to propagate the principles of law and love of forestry among the native people, and on the other hand, to keep close connection with the local authorities in order to prevent natural disasters and to protect the forests. However, in view of the fact that each forest ranger had in his charge an average of 80,874 acres which was too much for his supervision and the precipitous condition of mountain roads, with imperfect means of transportations, it was very difficult task to provide the necessary protection to the forests.

Under the circumstances, it was finally resolved to encourage the formation of Forest Protection Association among the local inhabitants of each district, giving them as their compensation some parts of forest products, so that they might, while protecting the State forests, realize the benefit of, and gradually awaken to the idea of, cherishing forests. As the result, the number of the associations reached 349 in all by March 1924 and they are now protecting total area of 3,118,464 acres of forests. It is also to be noted that in 1921, some prominent persons of each district were appointed as forest-protectors and ordained to assist the investigation of forests. It is bringing some amount of success.

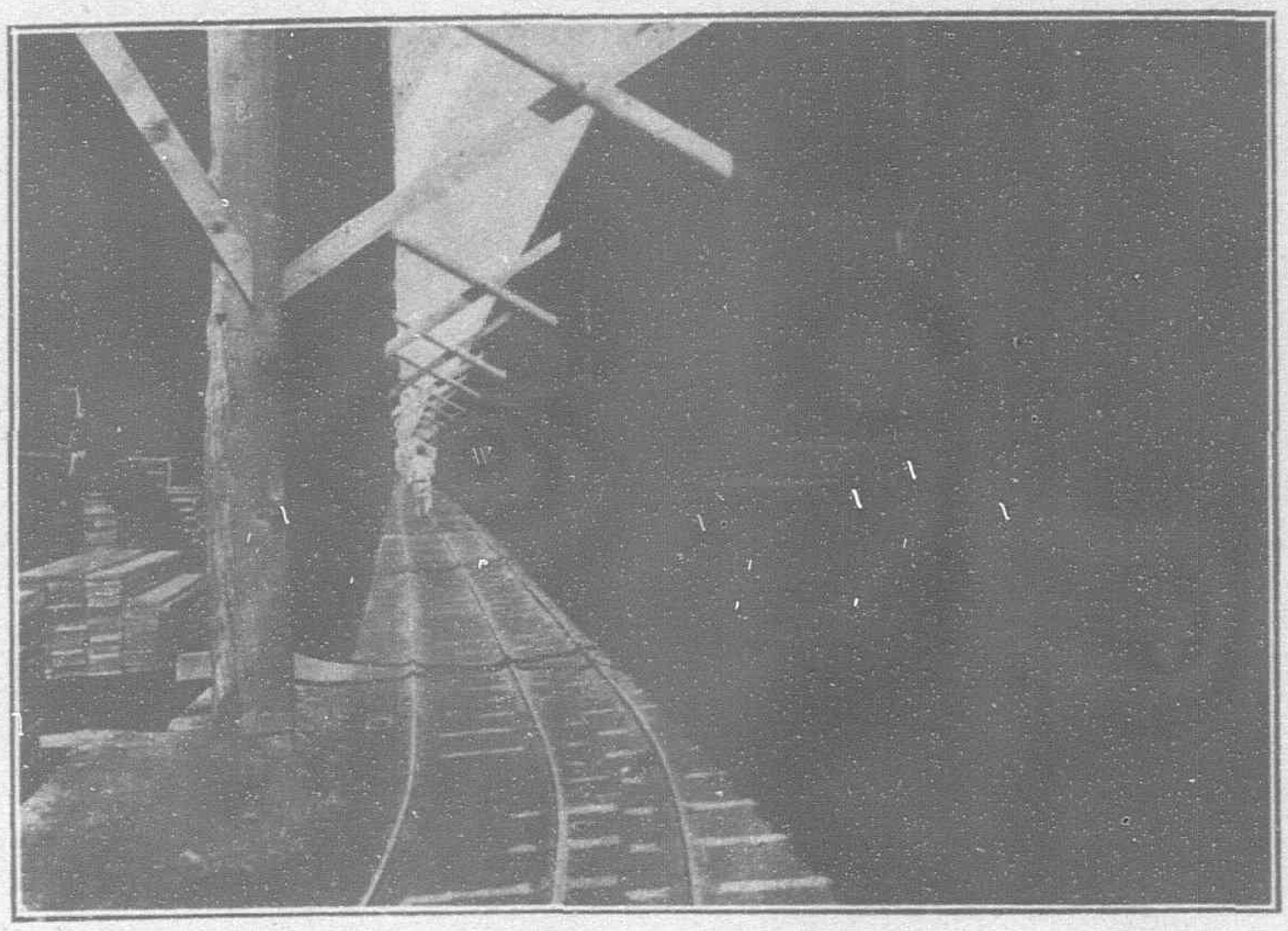
Further, in the fire seasons of Spring and Autumn, bills are posted in every important point propagating the necessities of precaution against fires and in other places, notice boards are erected to draw attention to the penal regulations of the forest law on other matters. Thus every step is carefully adopted to safeguard the forests.

Naturally, as the felling places of trees under the jurisdiction of the Bureau are gradually receding backward and with it the distance of transportation extending annually, the expenses of production are proportionally increasing. In order to save the expenses and increase the efficiency of transportation, therefore, it is necessary to lay a new truck line or open a road or make a canal amid the woods, each according to the condition of accumulation of trees and natural features of the land. All of these improvements are being accomplished annually. Where there is no communicating track in the depth of the mountains, a net work of telephone lines is instaled among the branch offices and between them and their working houses, thus maintaining the briskness of works of all kinds and mutual communications. By the end of the fiscal year of 1923, there were 48.7/10 of track lines, 146 miles of roads in the forests and more than 543 miles of telephone lines.

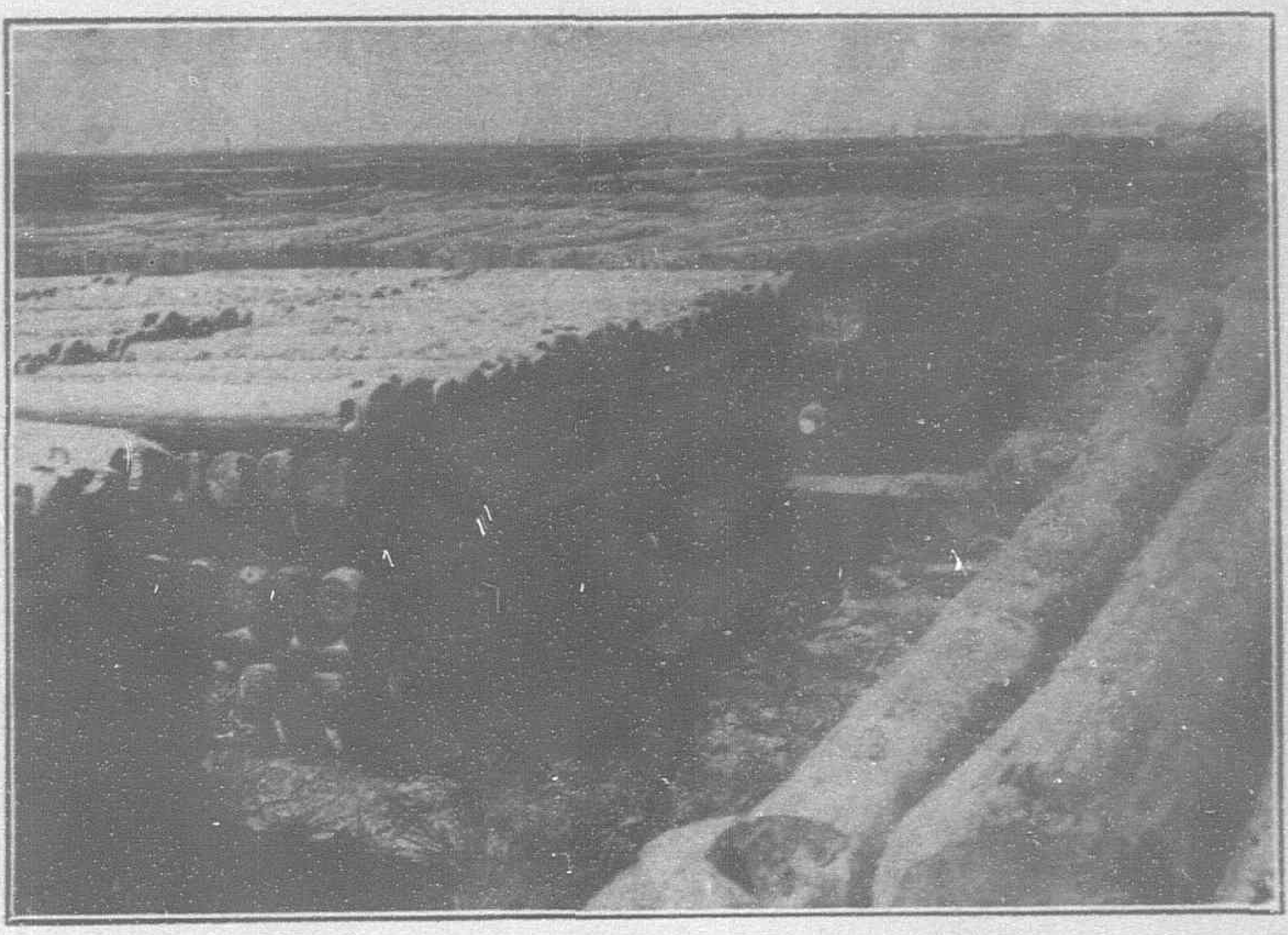
As to the management of forests under the jurisdiction of the Bureau, close attention is being paid to the maintenance of the equilibrium of felling and planting quantity of trees, and for the young trees planted either in the place from where old trees were cut down and carried away, or the place where there was no trees growing in the past, the natural renovation method is chiefly being adopted in bringing them up. At the same time, some seedling farms were newly established and in them experiments are being conducted on the rearing of seedlings. Thus, we are preparing to commence in the near future the artificial afforestation of the non-planted localities.



A Korean Saw Mill attached to the Goverment Forestry Bureau

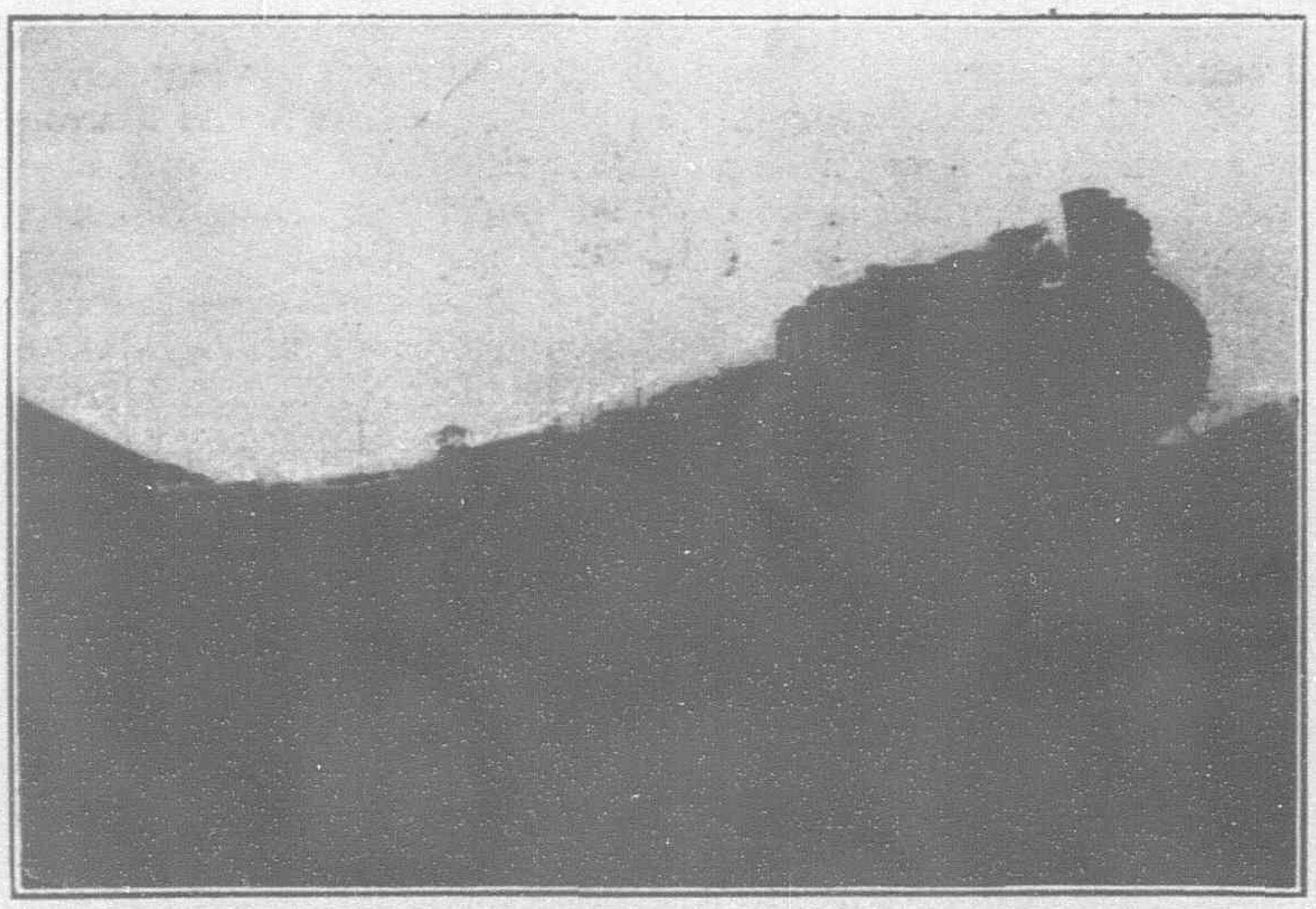


A Bureau Lumber Yard



A Timber Yard attached to the Bureau's Saw Mill

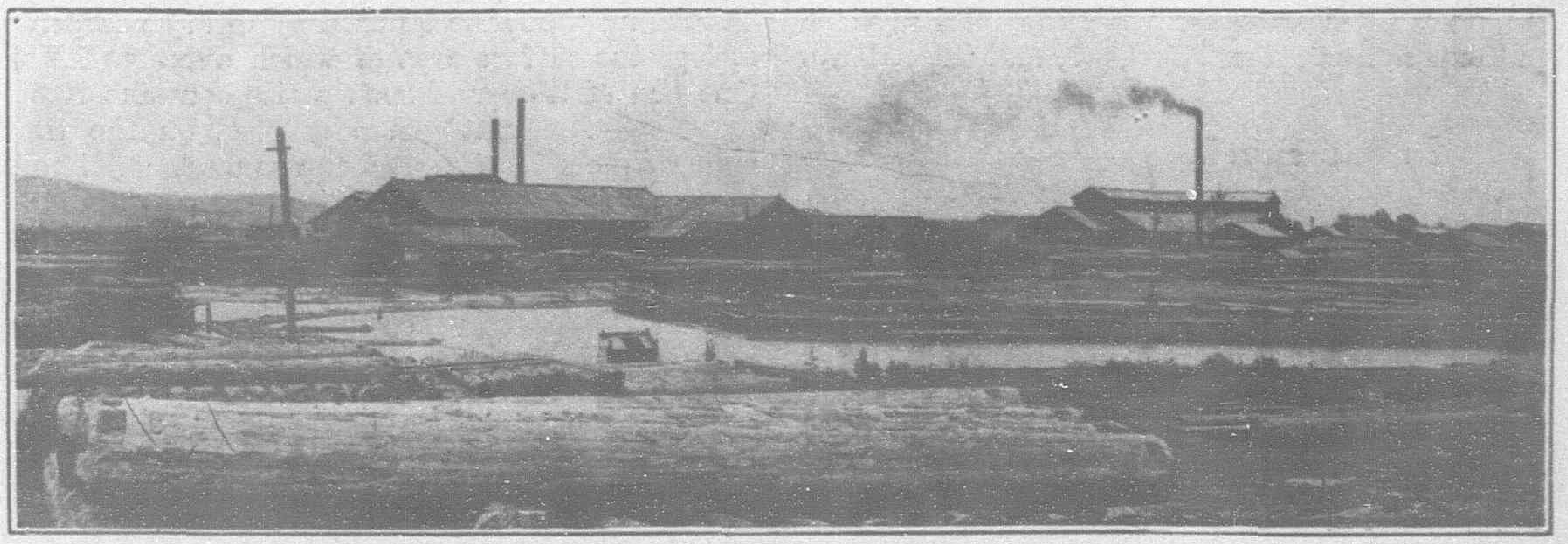
The forests under the jurisdiction of the Bureau are natural forests crowded with young trees of one year up to old ones of two or three hundred years. As it is, where old trees are felled, openings are made in the crowded forest introducing the sun's ray upon the young trees, invigorating their growth and thus grow up a successive forests in quite a natural manner. In such a natural cradle of trees, the rearing of a forest is most economically achieved and certain of its success. Hence, this thinning process is being practiced every year and the areas thus thinned amounted by the end of the fiscal year of 1923 to 5,475 acres.



Cars full of timbers and planks starting on the Service Lines

Of the total area of 5,197,200 acres of land under the jurisdiction of the Bureau, 392,115 acres are non-forested, and of this amount, 10 per cent. is to be entered in the tax-free land; 50 per cent. the natural cradle of trees which if placed under proper rearing method is sure to become a forest; 30 per cent. being situated in remote places, is valueless for any positive measures of afforestation; and the remaining 10 per cent. that is, 39,212 acres, is to be artificially afforested.

As stated above, half of the non-forested lands being the cradle of trees, the method of protective rearing is being applied in these places. For the lands where the method of artificial afforestation is to be applied, a plan was laid down some time ago to complete the afforestation within 30 years, but as it would require some years to complete the experiments to ascertain what kind of trees would be best suitable to the grounds under experiment, and on the other hand, as there are questions to be considered in regard to the finances the main effort is now being centred on the rearing of young trees, which is most economically and easily done.



Complete View of the Forestry Bureau's Saw Mills

The localities where trees are officially cut down at the present mostly are as follows:

In the catchment area of Yalu River:
- Gokei-sui River.
- Goze-sen River in Kozan district.
- Uncho-sen River.
- Choshin-ko River in Sansui district.
- Nansha-sui River in Kosho district.
- Ari-sen River in Kokai district.

The felling works were entirely assigned to contractors in former days, but in the fiscal year of 1920 direct management was introduced into some places and since 1923 all other places followed their examples. The results are very good as the measures help to improve the means of making timbers and to save the expenses of production.

As to the number of trees to be felled, it is so planned that the best result can be obtained within the limits of the fixed numbers of officers engaged in the work and the fixed annual quantity of trees to be felled. The quantity of trees cut down in the last five years averaged per year as follows:

Timbers cut	4,521,240 cubic feet
,, transported through mountains	4,255,608 ,, ,,
,, rafted and transported on the rivers	5,488,000 ,, ,,

Timbers to be rafted in the fiscal year of 1924 are estimated to be 5,388,000 cubic feet.

Though it is a recognized fact that the cutting and transportation of trees are best done with the organized hands of the Government, especially when it is viewed from the standpoint of renovation of forests, some standing trees are sold when required as materials for paper manufacturing, for a hundred uses of the local inhabitants and as necessity for mining works and some special industrial works, etc. Further, such trees as are damaged by insects are as far as possible sold in standing position to the public, beside being felled by the Bureau itself. Thus we are endeavouring to develop the benefit of forestry and at the same time encouraging the creation of general industries.

The places where standing trees are sold to the public are mostly situated outside the areas in which the Bureau carry on the cuttings; and the places are so selected that workings in them cannot interfere with those of the Bureau. In the past five years, the trees thus sold to the public amounted in an average per year to 9,556,080 cubic feet in quantity and Yen 348,426 in price.

In order to meet the buyers' desire and facilitate their means of selling the timbers made by the Bureau and at the same time to increase the Government revenue by the profit procurable from the timber productions and again on the other hand, to regulate the demand and supply of timbers in Korea, a lumber-mill was established at Shin-Gishu (Shin-Wijyu) and is now working under the administration of the Bureau. In the past five years, the timbers made by the Bureau amounted to an average per year of 1,979,136 cubic feet, and the expenses defrayed directly and indirectly in the lumber-mill were Yen 210,970. while the net profit gained in the work was Yen 278,147.

Since the great panic of the financial world of 1920, depression of trade continued to increase year after year and correspondingly the prices of timbers continued to go down by degrees. Facing the position, this Bureau had been exercising its utmost energy to promote the working efficiency and to minimize the working expenses when the disasterous earthquake and fires occurred in the eastern provinces of Japan, including Tokyo in last September, and suddenly increased the demand for timbers. Thus, the Bureau could contribute something in reconstructive works of Tokyo and other places by forwarding 120,000 cubic feet of timbers, besides supplying the usual demands in Korea. Prior to this occurrence, when the great floods damaged the provinces of Western Korea in 1922 and 1923, the Bureau tried its utmost in producing timber and to supply them at the cheapest prices to the poor inhabitants in the localities suffering from the floods to let them realize the benevolent wishes of the Government. And the result of sales is excellent as will be seen from the following figures obtained in the last five years: (average per annum)

Timber not worked ..	1,246,728 cub. ft.	Yen 482,115
Timbers	1,988,820 ,, ,,	,, 2,227,870
	Total	Yen 2,709,985

As to the adjustment of drifting timbers on the Yalu River, an agreement was made some time ago with the Saiboku (Wood-collecting) Company and works are being carried on a basis of mutual assistance. For the catchment of the Tumen River, the Japanese General Consul at Chientao made, in 1918, a covenant with the district magistrate of Chinchun for the same purpose. A little later, however, in June 1918, with the revision of the Law of Risk at Sea in Korea, the head of the Bureau was entrusted to administer the rescuing works of drifting woods on the Yalu and Tumen Rivers and as its result, the rescuing is being very satisfactorily performed since then. The quantity of timbers adjusted by the Bureau in the last five years is as follows in average per year:

Timbers rescued	517,776 cubic feet
,, returned to owners	294,096 ,, ,,
,, accepted by the Bureau	293,100 ,, ,,

For the last five years in average per year, the total revenue is Yen 4,572,730, and expenditure, Yen 3,893,567, and the balance in excess, Yen 679,163.

In Manchuria

Forestry in Manchuria supplementing the above article on forestry in Korea, the Government Bureau of Economic Information has published the following article on "Timber Trade on the Yalu":

The Yalu River valleys in Manchuria near the Korean border are important timber land. Deforestation was prohibited during the larger part of the Ching dynasty, and it was not until about the middle of the nineteenth century, when Shantung farmers emigrated into Fengtien province and reclaimed the forest land, that tree felling started. Timber merchants transported the timber to Tatungkow for sale. The Government then began to direct its attention to the forests, and established a collectorate for a timber tax. In 1902 the Mu Chih Afforestation Co. was organised with a joint capital of Tls. 200,000 subscribed by merchants and the Government of the "Three Eastern Provinces." It issued loans to timber merchants and protected their timber yards, timber and rafts. The Intendant of the Tungpien Circuit was appointed Superintendent of the company. The progress of the company, however, was hampered by the Russian forestry company and its saw-mill at Lungyenpu, Korea. The conflict in the following year (1903) between the Russian company and the Yi Sheng Company, a Sino-Japanese concern, resulting from competition, caused an international dispute on deforestation of the Yalu Valleys. During the Russo-Japanese War in 1904, when the Yalu was held by Japanese troops, the timber on the banks came into the hand of Japanese. The Japanese government also collected timber at Antung, investigated timber market conditions, and established a special bureau for dealing and transportation, under the control of the military commandant. In 1905 the Military Timber Yard was established in charge of all matters concerning timber supply from the Yalukiang. After the withdrawal of the Japanese troops, the Military Timber Yard was changed into the Timber Yard. In September 1908, in compliance with a provision in an agreement concluded after the Sino-Japanese Conference in 1905, and with the regulations governing the organisation of a Sino-Japanese timber supply formulated in May 1908, the Timber Yard was abolished. In its place appeared the Yalukiang Timber Co. which is now operating with a total capital of $3,000,000 subscribed in equal proportions by the Chinese and the Japanese Government.

The Yalukiang Forest occupies an area of about 30,800 square li. The timber reserve was estimated in Manchu times at 4,200,000,000 cubic chih, of which nearly 90 per cent. has been consumed, leaving at present only 504,000,000 cubic chih. The following are the important woods and their uses:

Red pine (*rinus densiflora*).—These trees attain a height of 80 chih and a diameter of 4 *chih*. The timber is excellent and is used chiefly in building houses and making furniture and coffins.

Fir (*conninghamia lanceolale*).—The timber is slightly inferior to red pine, but cheaper in price. It is largely used in making telegraph posts, masts, planks, beams, rafters and other ordinary building materials.

Larix chinensis.—These trees abound on the Changpeishan. Some of them attain a height of 100 *chih* and a diameter of 3 *chih*. The timber is fine-grained, hard, and durable. It is used in building houses, bridges, and ships, and making sleepers, telegraph poles, masts and other articles.

"*Resin*" *pine, or yu sung* (*keteleeria davidiana*).—These trees abound on the lower reaches of the Yalukiang. The large ones are 4 *chih* in diameter and over 100 *chih* in height. The timber is hard, durable, and rich in resin. It is used chiefly in building houses, bridges and ships.

Taxus cuspidata, var. Chinensis.—The timber is hard, fine-grained, elastic, and does not easily crack. It is valuable for making small wooden articles, ceilings and pillars in Japanese houses, pencils, and other articles for carving, on account of its elegant appearance.

Other Woods.—The broad leaf trees, including tamarack, sandalwood elm, oak, walnut, catalpa, poplar, birch, and others, also have extensive uses.

The following are different units commonly used in measuring Yalukiang timber:

Lien.—Timber of any diameter measuring 8 *chih* in length is called *lien*. Timber of any diameter and 16 *chih* in length is two *lien*. Yalukiang timber to be used by Chinese carpenters consists chiefly of logs the surface area of which averages 1.2 to 1.3 square *chih*. One *lien* of timber of such a size contains 10.8 to 12 cubic *chih*.

Fu.—The unit generally used on the timber market is *fu*, which equals 11 *lien*. At the same time, timber is also expressed in *tsun* units, to signify its size.

Tsun.—One *tsun* of timber is timber of 8 *chih* in length having a surface area of one Chinese square inch. A *fu*, or 11 *lien*, of log having a surface area of one square *chih*, for example, will be 1,100 *tsun*.

Liao.—A log of 60 *tsun* is called *liao*.

Chi Chih.—Timber for Japanese carpenters is in units of *chi chih*, for convenience on the Japanese and the Korean market. One *chi chih* is 12 cubic *chih*.

The Yalukiang Timber Company was organised in August, 1908, by agreements between the Mukden government and the Japanese consul. It was to have a tupan, or director-general, two directors, two or more managers, and a number of experts and clerks. The intendant of the Tungpien circuit was appointed concurrently director-general of the company. All the other officers were to be Chinese and Japanese in equal numbers. The company was at first divided into four departments: department of investigation; department of business; department of accounts; and secretariat. A permanent branch office of the investigation department was established in Shahochen and during the summer season temporary branch offices were opened at Hunkiangkow and Mashihtai, to examine rafts. There was a timber yard at Liutaokow under the business department. Later, the investigation department and the business department were amalgamated into the general department. There are also three organs attached to the Company: the Bureau for Timber Salvage on the Yalukiang, the Saw-Mill Co. and the Bureau for the Protection of Timber Trade.

Bureau for the Salvage of Timber on the Yalukiang.—All timber on the Yalukiang, aside from that on the Korean coast, was to be salvaged by the Yalukiang Timber Co. But in practice the salvage was in the hand of the Timbermen's Guild during the first few years after the establishment of the company. In May 1915, when the Bureau was established at Liutaokow, Antung and branch bureaus at Changpei, Shihsantaokow. Maoerhshan, Tunghwa, Hunkiangkow, Mashihtai and Shahochen, salvage by the company was enforced. The timber was to be returned to the original owner. If nobody claimed to be its owner, it was to be disposed of by a convention between this bureau and the Ying Lin Chang a similar organ of the Korean government.

Saw Mill Company.—In 1908 Japanese merchants operated saw-mills at Lungyenpu on the Korean coast and Shahochen in Antung. These two mills were amalgamated in 1913 into the Akida Timber Company with a large mill at Liutaokow. In October 1915, the Yalukiang Saw-Mill Company was organised by the Yalukiang Timber Co. and the Akida Timber Co. with a capital of $500,000 equally subscribed by these two companies. All saw-mills were operated by the new company. It was equipped with drying rooms to season timber. It employed about 1,000 workmen. The machines were of 538 h.p. The yearly consumption of logs in the mills amounted to 370,000 *chi chih*. The timber consisted chiefly of planks for building houses and making boxes. As a result of growing prosperity, a branch mill was established in Kirin in November, 1917.

Bureau for the Protection of the Timber Trade on the Yalukiang and the Hunkiang.—The Timbermen's Guild in Antung was organised by timbermen to protect the timber trade, to settle any dispute among them, and to salvage floating timber on the river. On the establishment in 1915 of the Bureau for Timber Salvage, the Timbermen's Guild lost control of the salvage. But disputes often arose among the thousands of timbermen and timber-yard owners. In order to encourage the timbermen and promote the trade, the intendant of Tungpien, at the instance of the Yalukiang Timber Co., reorganised the Timbermen's Guild into the Bureau for the Protection of the Timber Trade on the Yalukiang and the Hunkiang. The timbermen and timber-yard owners were to appoint four representatives and pay a tax of 1.35 per cent. *ad valorem.* One per cent. of the tax was to be used for the expenditure of the bureau, and the remaining 0.35 per cent. for educational expenses in the districts of the Yalukiang valley. The tax was collected by the Yalukiang Timber Co. In May 1919, 0.35 per cent. of the tax was collected direct from the office of the intendant of the Tungpien circuit, while 1 per cent., then having been reduced to 0.6 per cent., remained to be collected at the bureau.

Branch Offices of the Yalukiang Timber Company.—The company at first had three branch offices, at Changpei, Linkiang and Tunghwa. New branch offices were later opened at Shihsantaokow between Changpei and Linkiang and Pataokiang, on the upper reaches of the Hunkiang.

Improvements of the Company.—(1) *Forms of Timber.*—Timber from Antung was formerly cut, as a rule, in square logs of eight *chih* in length, i.e., in *lien* units. The cutting of stems into square logs results in a great waste. The company in 1911, therefore, introduced Japanese cutting, i.e., " kien " units of six *chih* in length, and also prepared telegraph poles and other smaller poles. Recently, sleepers, railway material and butts of rifles have also been made.

(2) *Rafting.*—Chinese rafting is strong, but clumsy, and on being dashed against the rocks, the entire raft is wrecked. Japanese rafts move freely, especially on turning bends, and on being driven on the rocks, are ruined only in part. A Japanese raft requires only two raftsmen; in this respect, Japanese rafting is again better than Chinese rafting. During recent years Chinese raftsmen have been seen on Japanese rafts on the Yalukiang.

(3) *Communication Facilities.*—The company since its establishment has been operating a light railway in Changpei constructed by the Timber Yard of the Japanese. The railway at first covered only three miles in length, but was extended in 1914 by the company. The company also constructed a light railway and established the Bureau or Timber Transportation in Sanchatze, Pataokiang. Communications were further facilitated by the installation of telephones in important places.

(4) *Timber Ground and Raft Harbor.*—After the abolition of the branch office at Tatungkow, the company established a timber ground at Liutaokow. The service of the timber ground was then only to fasten the rafts; and it was not until 1911 that a harbor was erected for free entrance and clearing of rafts during the flow of tide. In 1914, the company succeeded in persuading the South Manchuria Railway Company to construct a branch line for the convenience of timber loading. The ground is also a depot for the custody of merchants' timber.

(5) *Investigations of Forest Conditions.*—In 1914, the company sent investigators to Changpei and Shihsantaokow to investigate forest conditions there. The investigations in these areas and in Maoerhshan and Pataokiang have now been complete.

The timber output from the Yalukiang forest averages 1,500,000 *chi chih* a year, but has grown with the prosperity of the company since 1914. The supply comes from four sources: (1) felled direct by the company; (2) felled and transported by timbermen with capital borrowed from the company; (3) felled and transported by timbermen with capital supplied from dealers who borrowed it originally from the company; (4) felled by timber yards and sold to the company.

(1) *Timber Felled Direct by the Company.*—Felling was at first confined to Changpei. The light railway at Shihkiutaokow. Changpei, handed over by the Japanese Timber Yard, afforded another means of transportation. But transport by the river was slow, its course being abrupt, winding, and accumulated with rocks. The timber received from the Japanese Timber Yard took the company three years to complete transported. The trade became more active by shifting the company's headquarters to the neighborhood of tributaries of the river and by sawing timber into logs of suitable size more convenient for transportation and equally useful. Tree felling and timber cutting by the company are generally done through contractors. The work of the contractors is divided into five divisions: (1) tree felling and timber cutting; (2) transport of the timber from the forest to the light railway station or to the river side; (3) transport of the timber by light railway; (4) conveying of the timber to the river; (5) making and drifting of rafts. Small advances are usually given to contractors before work is started. After the completion of one division, 82 per cent. of the price for that division is paid, the remaining 18 per cent. being paid when all divisions of work are complete. The company's deforestation work extended in 1914 to Maoerhshan, Shihsantaokow, Tunghwa and Pataokow. All divisions of work are done through a sole contractor, and the rafts driven right on to Antung. The following shows the number of rafts and the quantity of timber in *lien* units for the years 1908 to 1917 supplied from the company through contractors, not including the other three sources:

Year	No. of Rafts	Quantity of Timber
1908 (first year of operation) ..	127	20,113
1919	782	114,591
1910	62	41,239
1911	49	16,496
1912	9	3,073
1913	112	31,151
1914	330	82,021
1915	518	234,227
1916	431	198,982
1917	813	361,006
Total	3,233	1,102,899

(2) *Timber Felled and Transported by Timbermen with Capital Borrowed from the Company.*—The timbermen cf Yalukiang and Hunkiang are united in groups of several hundred men under a foreman. They are mostly drawn from the ranks of the unemployed from Shantung and naturally lack capital. Loans are often

advanced to those having good credit and having performed good work. To meet the convenience of the timbermen, the company supplies them with daily necessaries. Loans of money and the cost of daily necessaries are repaid plus interest when the rafts are sold at Antung.

(3) *Timber Felled and Transported by Timbermen with Capital Supplied from Dealers who Borrowed it Originally fom the Company.*—The dealers are not timber experts. They operate timber yards and supply the timbermen with capital. Sometimes, when the dealers lack capital, they may obtain a loan from the company and re-lend to the timbermen. For such a loan to timber yards, guarantees from other timber yards and securities with immoveable property are necessary.

(4) *Timber Felled by Timber Yards and Sold to the Company.*—The company has the right to purchase all timber from the Yalukiang. With a view to protecting the interests of timber yards, the quantity purchased in a year, however, is small.

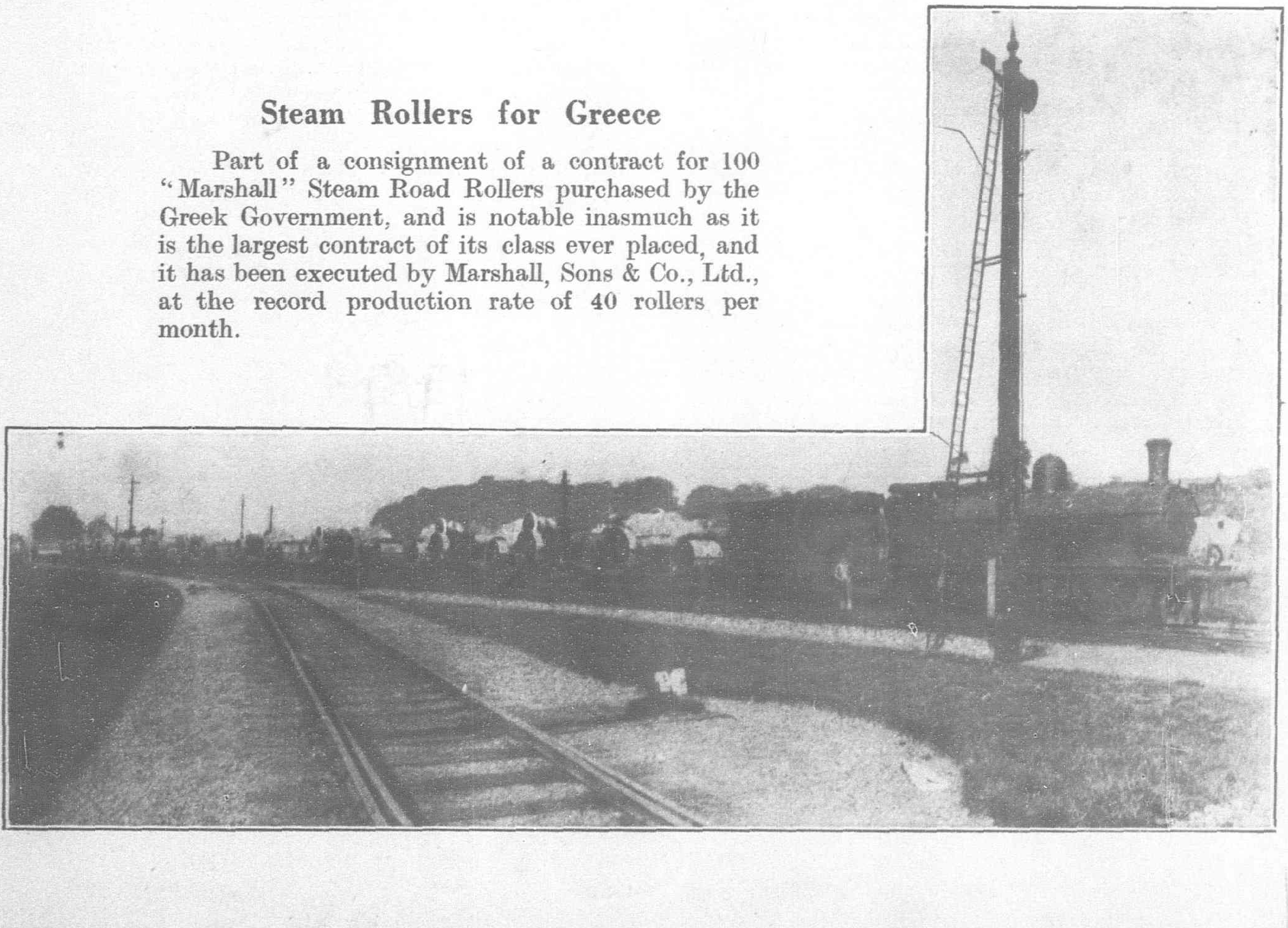
ANTUNG AS TIMBER TRADE CENTER

The timber of the company was formerly deposited at Tatungkow at the month of the Yalukiang. Timber yards were found therein and at Takushan, 90 li on the lower reaches of Tatungkow. Antung was then only a small village. When the company was established, Antung became an important collecting center. Rafts destined for Tatungkow also anchored at Shahochen and Liutaokow. During the first four years of operation, the trade was not very brisk. It was not until the summer of 1912, when the price suddenly rose and the stock was nearly exhausted, owing to a reduced output caused by drought, that the company began to resume its activity. Fom 1913 to 1914, however, the price dropped, and the market became stagnant. Excessive supply was the principal cause, the sources being the immense growth in the amount of the floating timber due to the floods in 1913, the arrival of delayed transport during the drought season of the preceding year, and the import in 1914 from Japan after the European market was cut off on the outbreak of the Great War. The market in 1915 was improved. The lack of facilities for transportation led the European countries to purchase Yalukiang timber instead of American and Japanese pines. The company then extended its operations. In the spring of 1916, the Scott, Harding & Co., the Kow Kee Timber & Saw Mill Co., and other Shanghai and Tientsin merchants collected timber from Korea, as well as from Antung. Formerly, Tientsin was the first important center of distribution of Yalukiang timber, and next came the principal ports in Shantung, followed by Manchuria and Korea, very little being distributed at Shanghai. The success of saw mills in Antung in 1913 brought Antung into the first rank in the list of centers of distribution. In 1914 Fushun also became a center of distribution. The demand for timber in Shanghai grew in 1915. But Shanghai has been the market for Chinese timber competing with foreign timbers while Fushun remains the market for Yalukiang timber competing with Kirin timber. Dressed timber from Antung is consumed chiefly in Dairen, Port Arthur, and Korea and also in Fushun, Newchwang, Mukden Antung, and other parts of Manchuria. The price of timber in Antung was formerly lower in the autumn than in the spring, and the lowest in the beginning of winter, owing to the ice-locked condition of the river during the cold and dry seasons. During recent years, however, sleepers, telegraph and other poles, and building material have been transported by rail throughout the year, instead of by water during the navigable months. Prices have, therefore, no longer been subjected to changes of season. Exports destined for Korea and the South Manchuria Railway zone are usually loaded at Antung and Sinichow. During the Great War, transportation was sometimes carried on by railway even when rivers were navigable to steamers, owing to the lack of vessels. Only vessels capable of drawing 12 feet of water can enter and clear the Yalukiang freely, on account of the shallowness of the river. But at Santaolangtow, seven miles along the lower reaches of the Yalukiang, vessels capable of drawing 14 feet of water can anchor, and the water near the Korean coast is deep enough for vessels of a few thousand tons.

TAXATION ON TIMBER

The Timber Tax Collectorate collects a tax on all transactions, the tariff having been fixed by agreements between the Chinese and the Japanese government. Formerly, the tax was paid by the Timber Company, who charged the same amount to the buyer. In order to economise time on the buyer's side, it was later found expedient that he should pay the tax directly, except when far away or under other unfavourable conditions. The tax was formerly charged according to the quantity of the timber, but has been changed to 6.6 per cent. *ad valorem*. In addition to the tax mentioned above, timber dealers have to pay a customs duty of 2.5 per cent *ad valorem* for exports by junks, or 5 per cent. *ad valorem* for exports by steamers. The receipts of the collectorate have increased during recent years.

Steam Rollers for Greece



Part of a consignment of a contract for 100 "Marshall" Steam Road Rollers purchased by the Greek Government, and is notable inasmuch as it is the largest contract of its class ever placed, and it has been executed by Marshall, Sons & Co., Ltd., at the record production rate of 40 rollers per month.

Highway Construction and Maintenance in the Philippine Islands

By Marcial Kasilag, C.E., Chief Construction Engineer, Bureau of Public Roads, Manila

ROAD work in the Philippine Islands during the eighteenth and nineteenth centuries, under the Spanish regime, consisted in the opening of routes of communication throughout the Islands, in a very thorough manner, thus leaving to the present Government a very valuable asset in the matter of right-of-way, which was incorporated into the law and became a part of the public domain.

Two types of highway construction were practiced under the Spanish administration: First, pavement of cut stone, usually of the adobe quality, because of its abundance and ease of quarrying and cutting. The size generally used was 20 by 20 centimeters and 50 centimeters long. This makes a very smooth pavement, but where an ordinary amount of traffic is encountered, wears very rapidly. Second, cobblestones. This pavement consisted of boulders taken from river beds, varying in size from 10 to 30 centimeters in diameter. It was very durable and lasted as long as the individual stones retained their position in a bed of earth, but was very rough, owing to the absence of a top course of small gravel commonly used on modern macadam roads.

The present Bureau of Public Works was organized in 1905, and a road system has been worked out and is being pushed to completion as fast as funds permit. The policy is to maintain those routes of communication already established, and extend others, until every section of the country, with justifiable productive traffic, is supplied with an outlet for its products. This consists primarily of the construction of first-class roads; the maintenance of existing second-class and third-class roads, until they can be reached by first-class construction, and maintaining and opening trails for cart and pack animal traffic and for communication into isolated and mountainous regions. In pursuance of this policy, the forty-eight provinces composing the Philippines, with the exception of the isolated small province of Batanes, have been organized into engineering districts, under the immediate technical supervision of the central office located in Manila. Each district is under the charge of a civil engineer, called a district engineer, and provided with a sufficient number of technical assistants. The capital of each province has thus become the center of development of provincial systems of highways, which, in conformity with the general plan, are being rapidly connected by through or inter-provincial roads, at the expense of the Insular Government.

Cagayan Province, Road—Tuguegarao-Iguig Road (Gravel Road)

Definitions for Road Classifications.

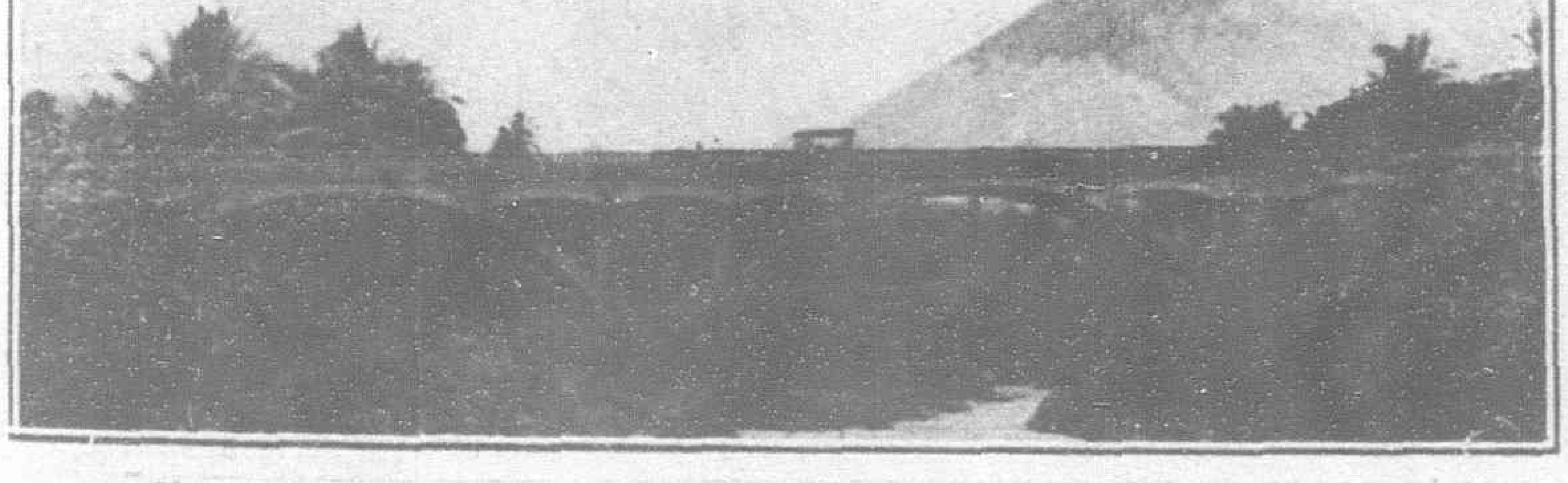
The foregoing classification of roads, as applied in the Philippines, has been defined as follows:

First-class Roads.—Well graded and surfaced, thoroughly drained and constantly maintained. Bridges and culverts are usually complete and permanent, and when missing, their places are supplied by ferries capable of carrying automobiles weighing two tons or more. These roads are continuously passable at all times, with possible exceptions during typhoon periods; width of right-of-way, 15 meters; roadway, 7 meters; and metalling, 5 meters.

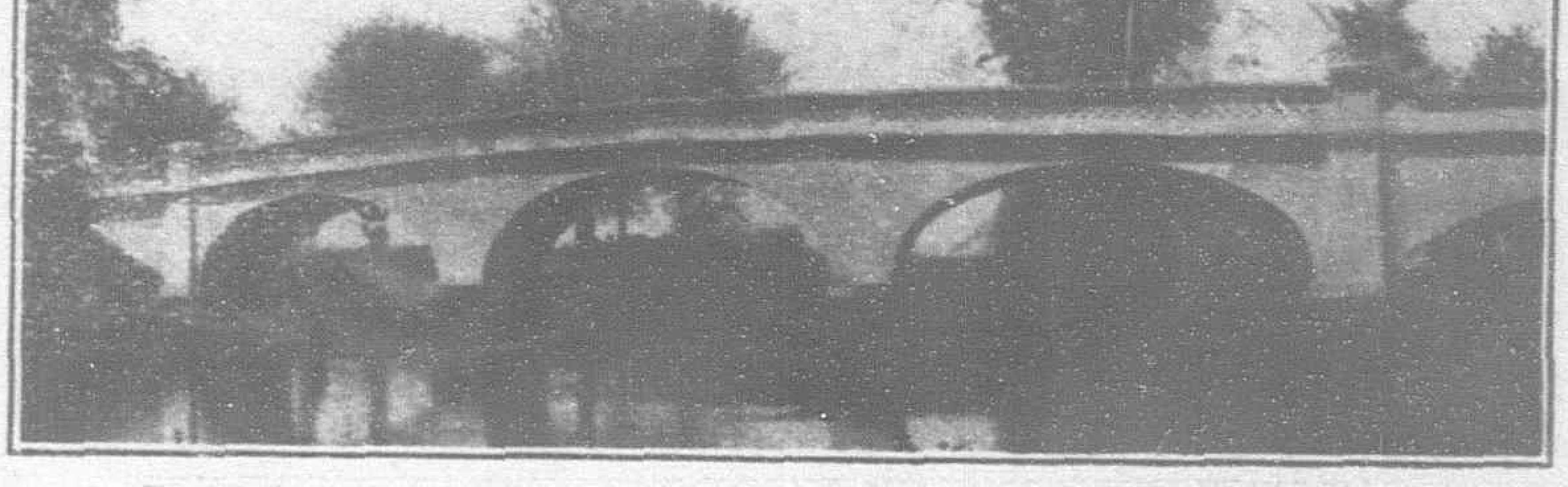
Second-Class Roads.—Fairly graded, partially or naturally surfaced, and generally intermittently maintained. Bridges and culverts are usually complete, but, in part, are temporary structures. Those roads are continuously passable for vehicle traffic during the dry season, but more or less impassable during the rainy season.

Third-Class Roads.—All traffic routes for carts not included in the first and second-class roads. Such roads are usually narrow, poorly graded or not graded, and generally impassable in the rainy season.

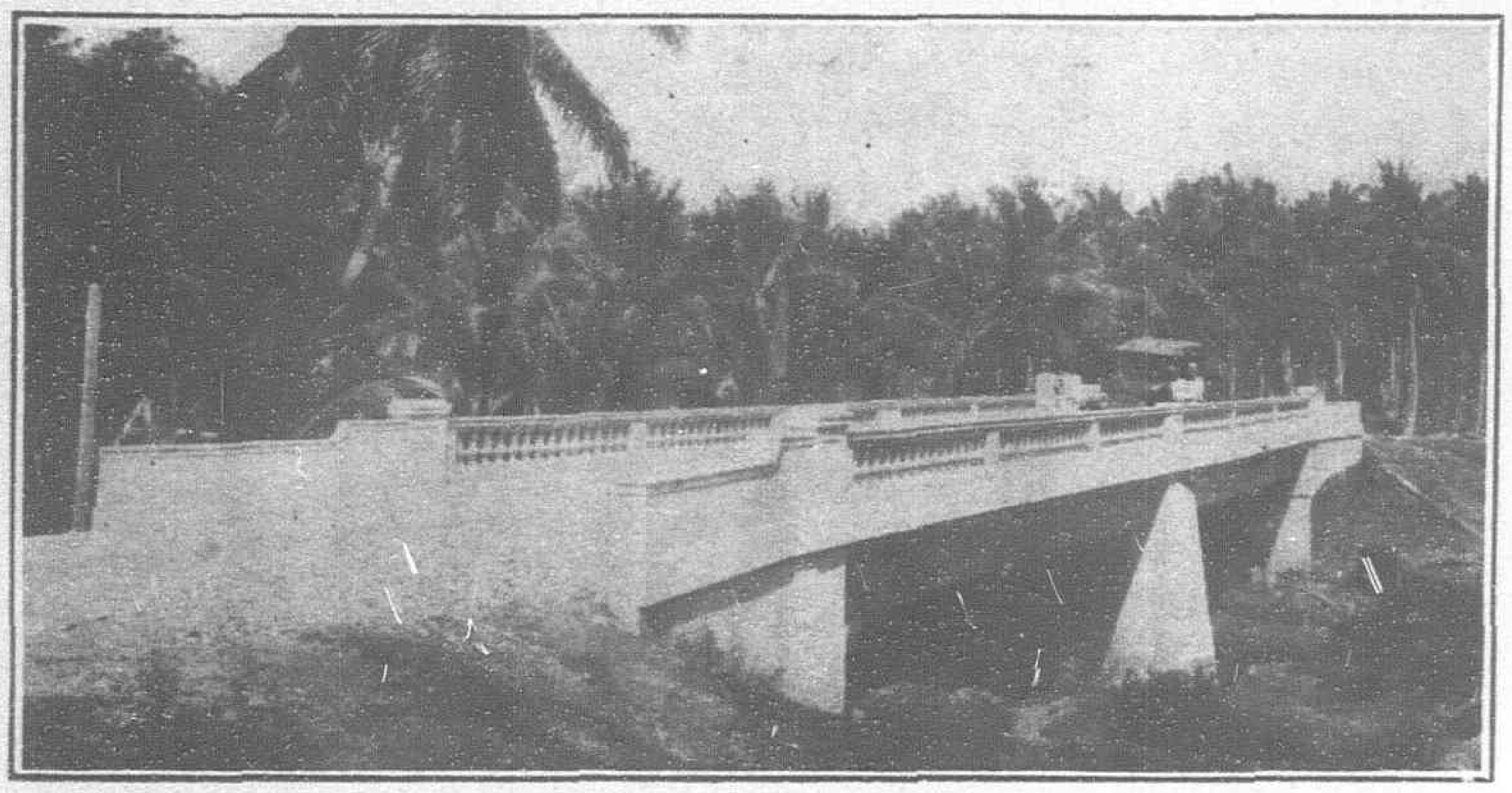
In accordance with the above classification, there were in existence, on December 31, 1922, the following lengths of roads in the Philippines:



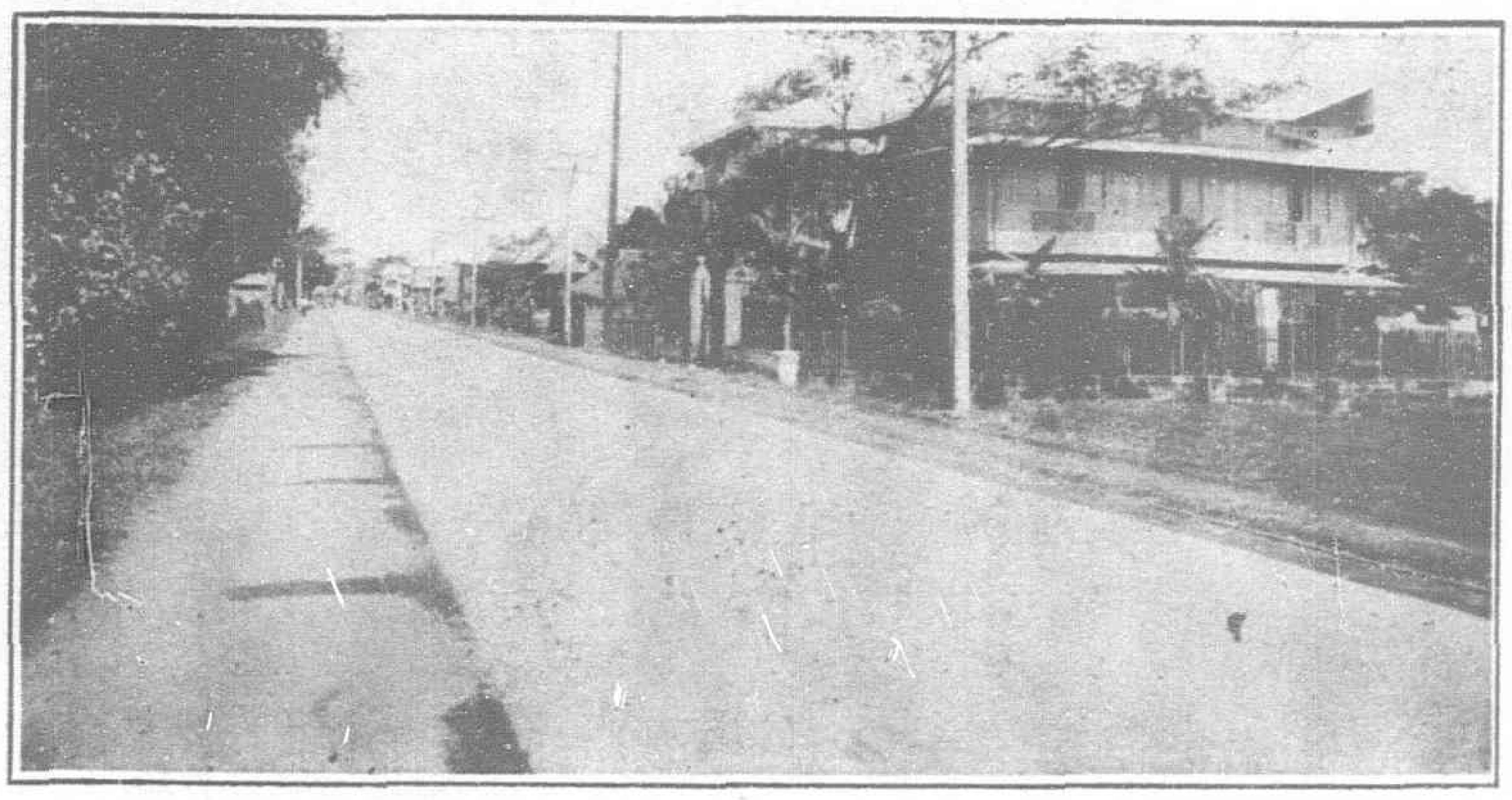
Albay Province, Bridge—The Governor Reynolds Bridge across the Banao River, 24 kilometers north of Legaspi



Rizal Province, Bridge—Darangan River Bridge, showing the automobile in the center of the bridge



Marinduque Province, Bridge, Gasang Bridge at Km. 16.97 at Boac-Gasang Road



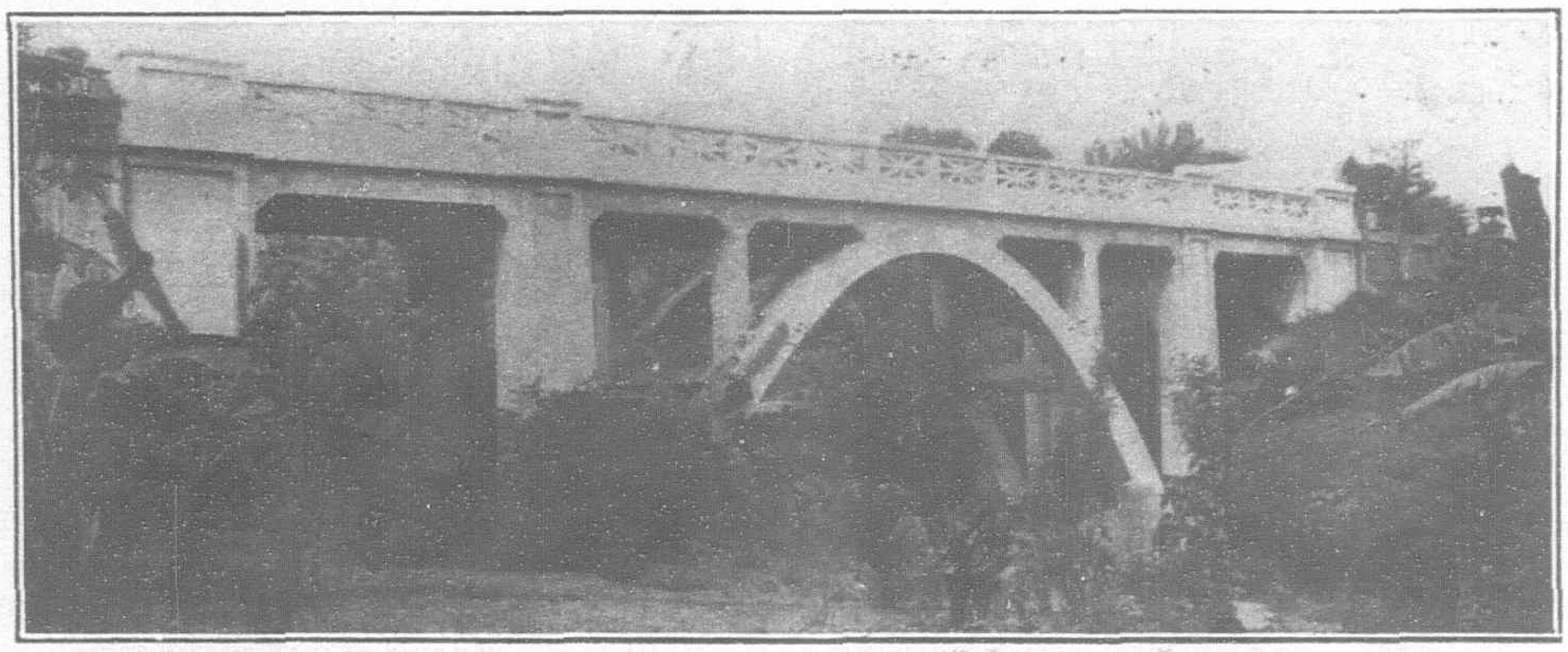
Rizal Province, Portland Cement Concrete Road—Manila South Road

First-class	4,982.3 kilometers
Second-class	2,115.5 ,,
Third-class	2,942.7 ,,
Total	10,040.5 ,,

Exclusive of the above kilometerage, there are, in addition, 4,647 kilometers of mountain trails.

Specification for Water-Bound Macadam and Gravel Roads

1.—Right-of-way.—The right-of-way shall be established by the Director of Public Works. The cost of any material obtained by the Contractor, or of any use made of land outside the limits of the right-of-way as established by the Director, shall be paid by the Contractor in accordance with whatever terms he may make with the owner or owners of said land. If requested, the Contractor shall furnish the Director satisfactory evidence of forms of agreements made with such land-owners, as a condition precedent to any payment under this contract.



Laguna Province, Bridge—Banaderes concrete arch bridge with open spandrels on the Manila South Road

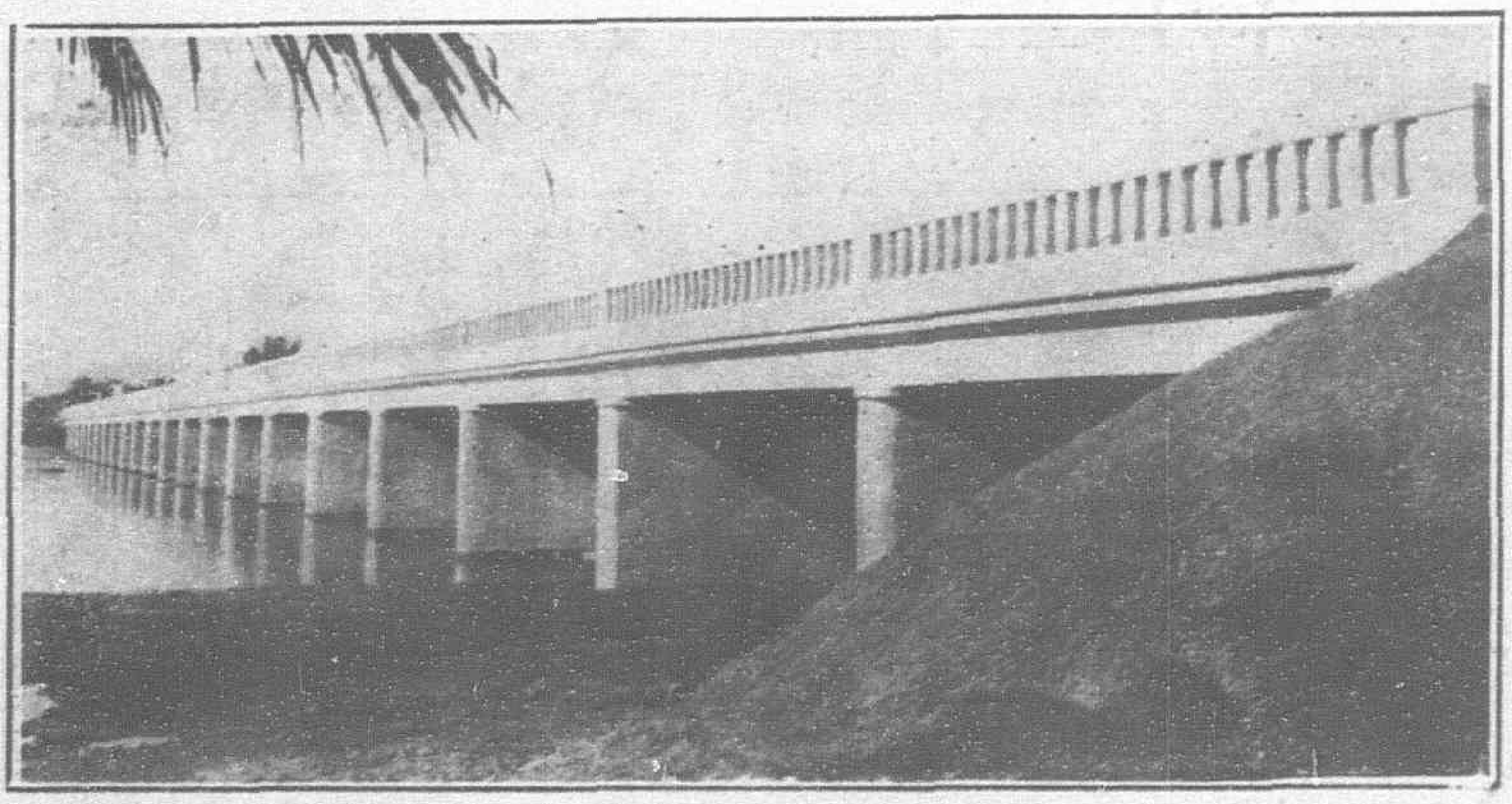
2.—Line and Grade Stakes.—The Director will establish all necessary grades and lines for the construction of the road and will set suitable stakes, which will be carefully pointed out to the Contractor, or his authorized representative. In setting grade stakes for the sub-grade, due allowance will be made for the thickness of the finished metalling, *it being understood that the center-line grade shown on the plans and profiles is that of the finished surfacing*, unless otherwise indicated.

All stakes, bench marks, etc., placed by the Director shall be carefully guarded and preserved by the Contractor, and in case such stakes or marks become displaced or rendered useless through the carelessness or neglect of the Contractor or that of this agents, employees, or workmen, they will be replaced by the Director, at the expense of the Contractor.

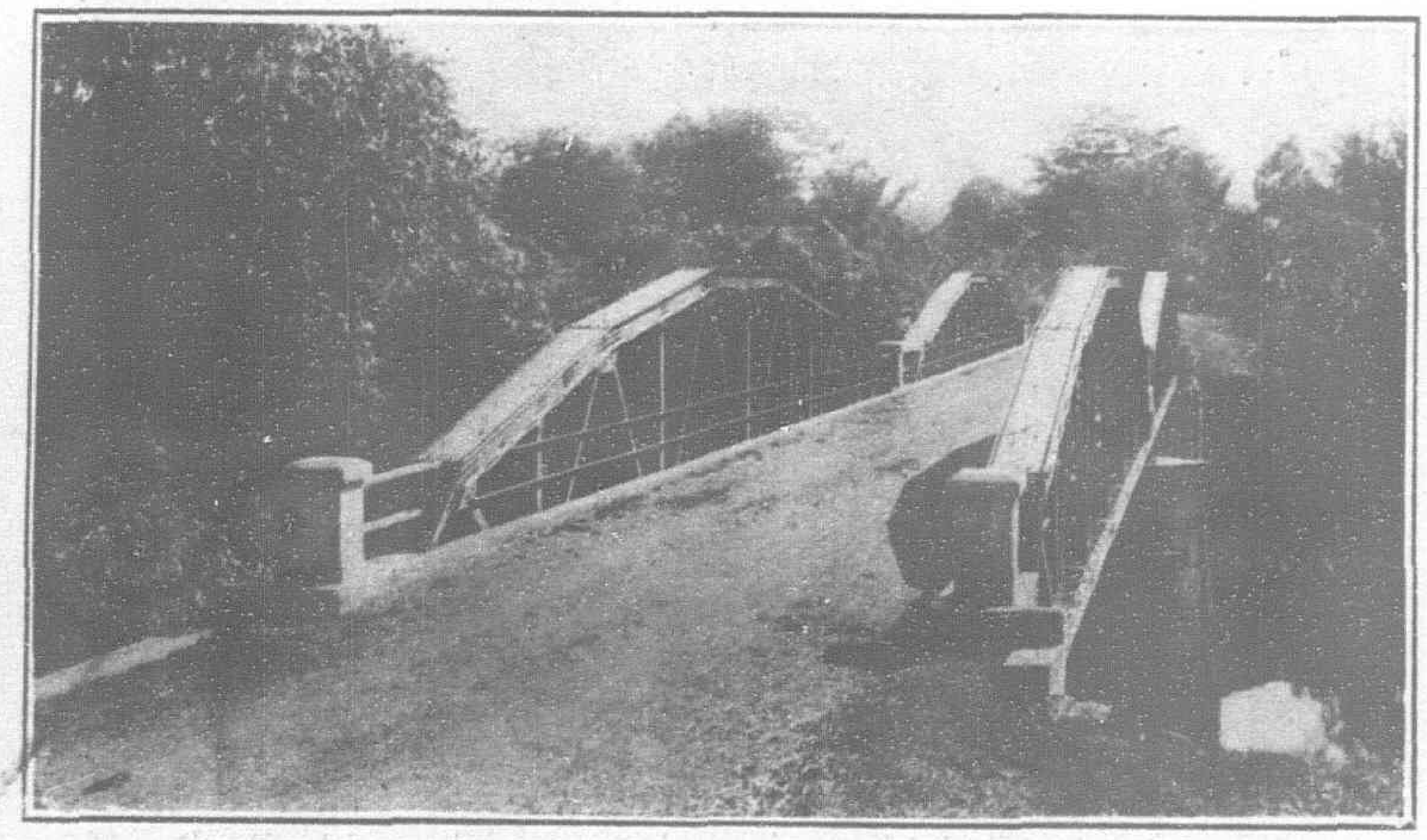
3.—Clearing and Grubbing.—The Contractor shall remove objectionable brush, stumps, fences, boulders, stones or other material, within the limits of, or overhanging the right-of-way. The Contractor shall clear and grub to a depth of at least fifteen (15) centimeters below the surface of the ground, or forty-five (45) centimeters below the surface of the finished subgrade, all trees, stumps, roots, fences, brush, boulders, stones or other material. All holes formed in making excavations shall be filled in with suitable material, well packed, rammed and consolidated as directed by the Director. The Contractor shall remove all existing improvements within the right-of-way as directed by the Director. Trees which do not interfere with the proper construction of the highway shall be removed only as ordered by the Director.

3a.—Classification of Material.—Excavated material moved as directed by the Director shall be classified for payment only as *Solid Rock, Loose Rock and Earth.*

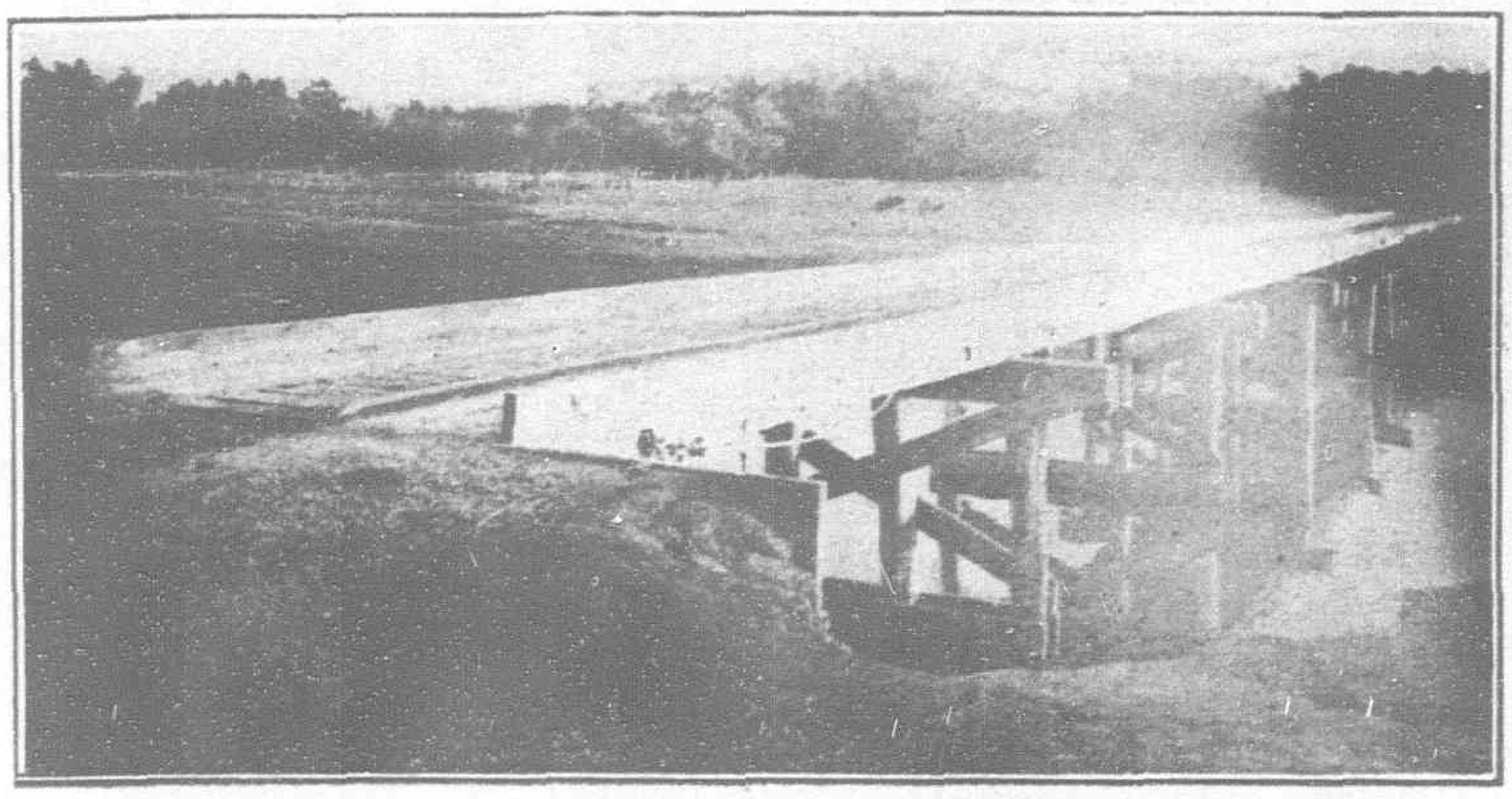
Solid Rock.—Shall include all rock in masses, or ledges, in their original or stratified bed, or position, hard adobe, and boulders and detached masses of rock exceeding one cubic meter in measurement.



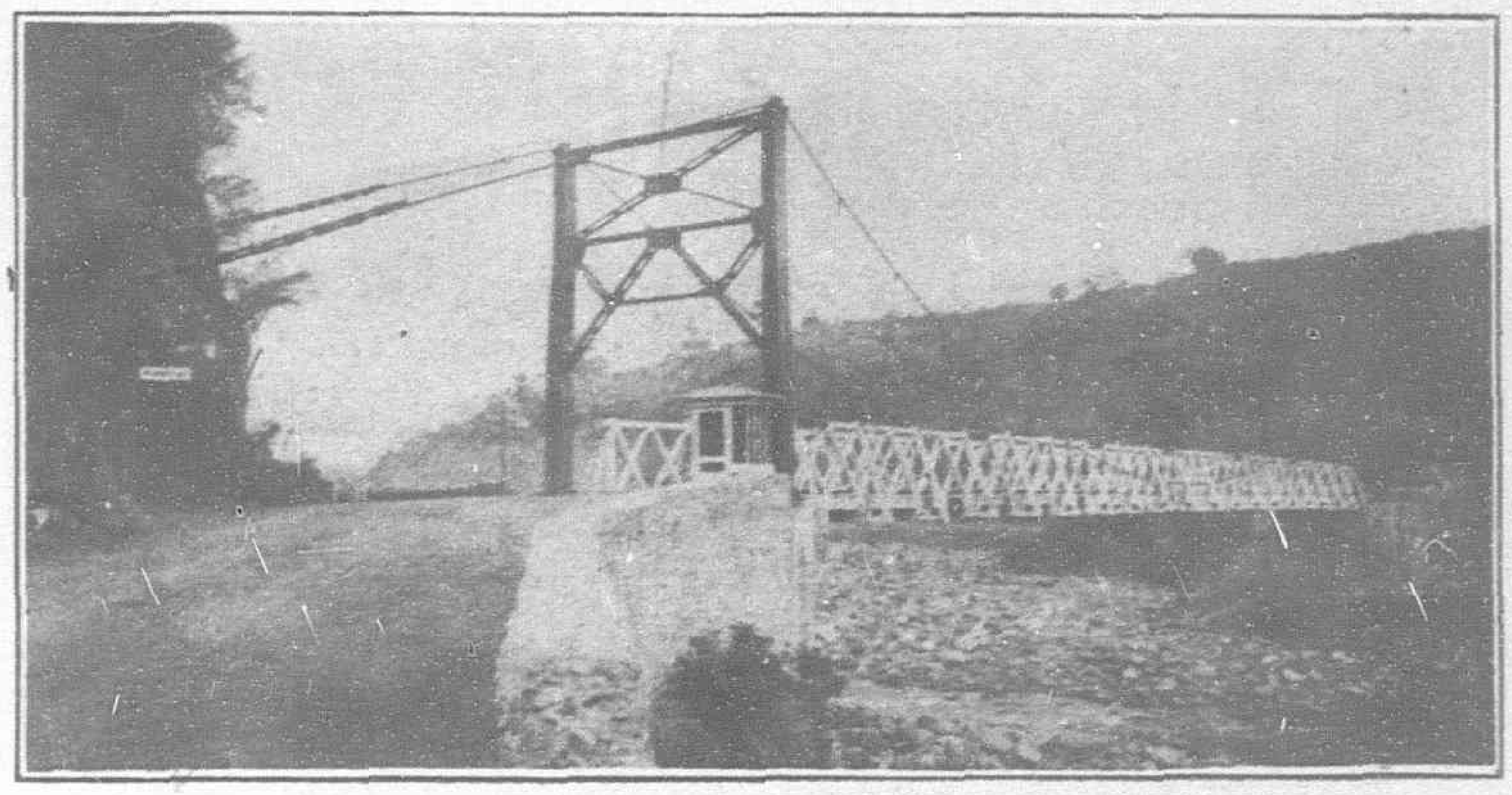
La Union Province, Bridge—Harrison Bridge at Barruro



Bulacan Province, Bridge -Sibul Steel Bridge on Sibul-S. Miguel de Mayumo Road



La Union Province, Bridge—Marragara Collapsible Bridge



Benguet Province, Bridge at Bued River, Damortes Road

Loose Rock.—Shall include all shale, slate, soft adobe and hard, and all boulders and detached rock exceeding one-tenth but less than one cubic meter, and all other materials which are not practicable to loosen and handle with pick and shovel.

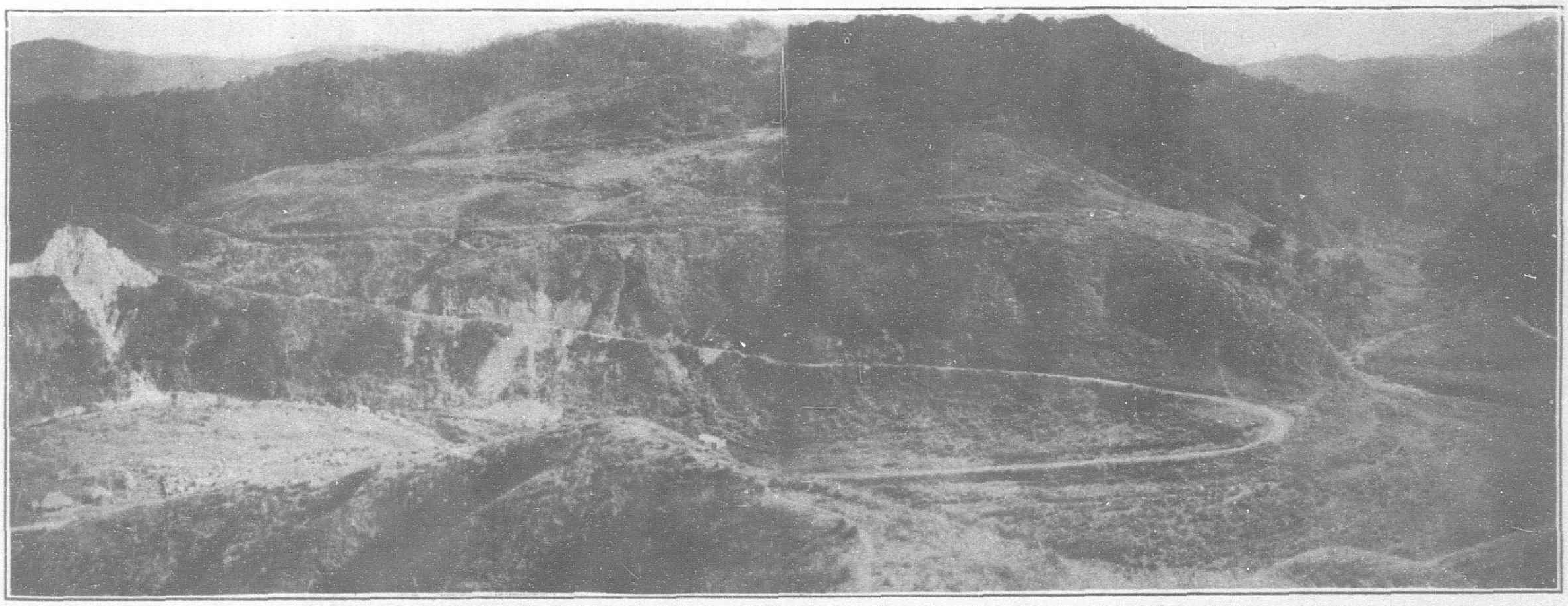
Earth.—Shall include all loam, clay, sand, gravel, and all other materials which are not included in the above specifications of loose or solid rock.

4.—EXCAVATION AND PLACING EARTH—Excavating and placing earth shall include the grading and excavating necessary for the roadbed, approaches for intersecting highways, ditches, side slopes and retaining walls as indicated on plans; the proper placing of material in embankment back of retaining walls, and all incidental grading, excavating and filling necessary for the completion of the subgrade, shoulders and ditches of the highway.

Excavation shall be measured in cut, and fills shall be measured in place, compacted.

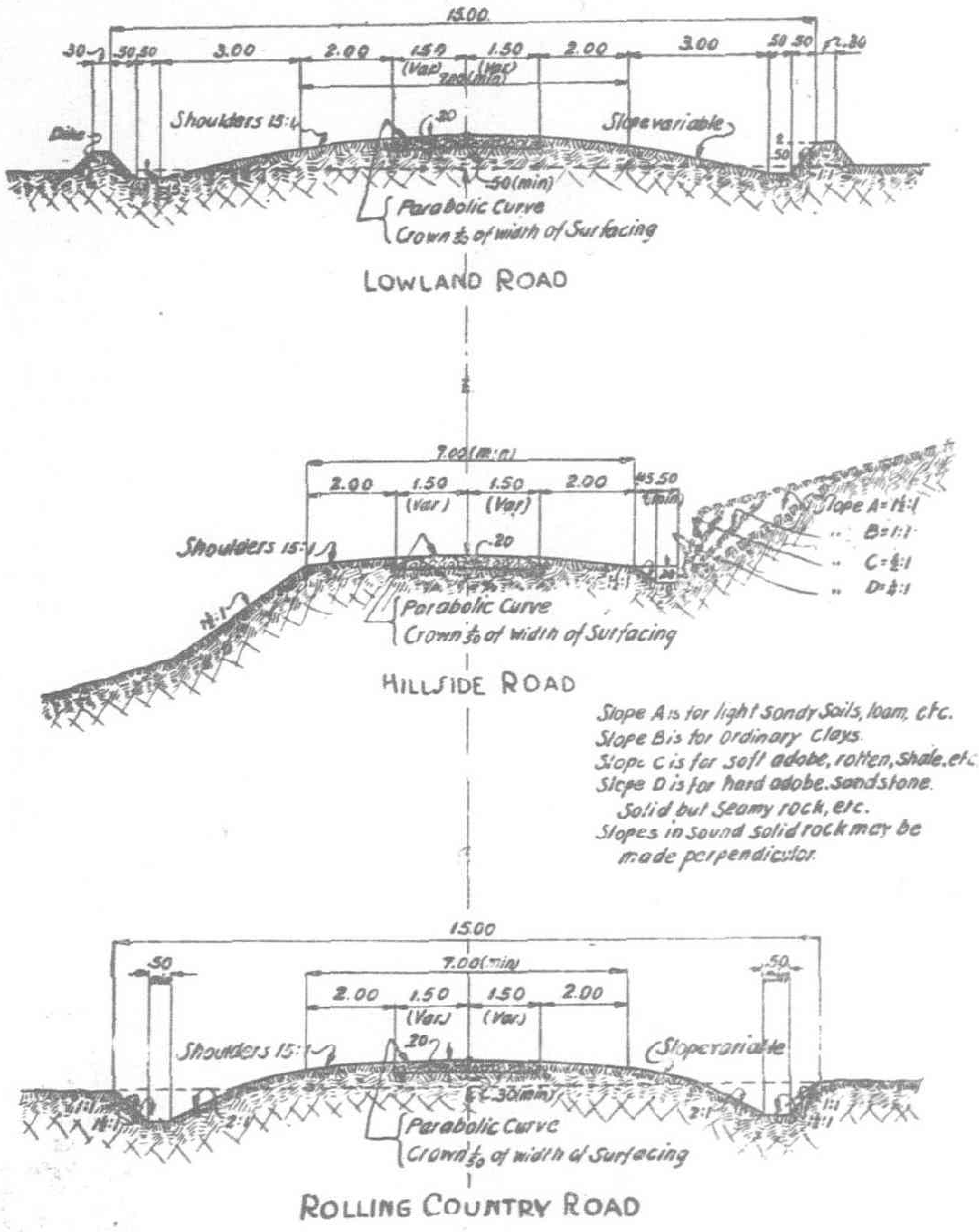
In cuts the material shall be removed to such a depth that the re-

Laguna Province, Road—Magdalena-Majayjay Road (Gravel Road)



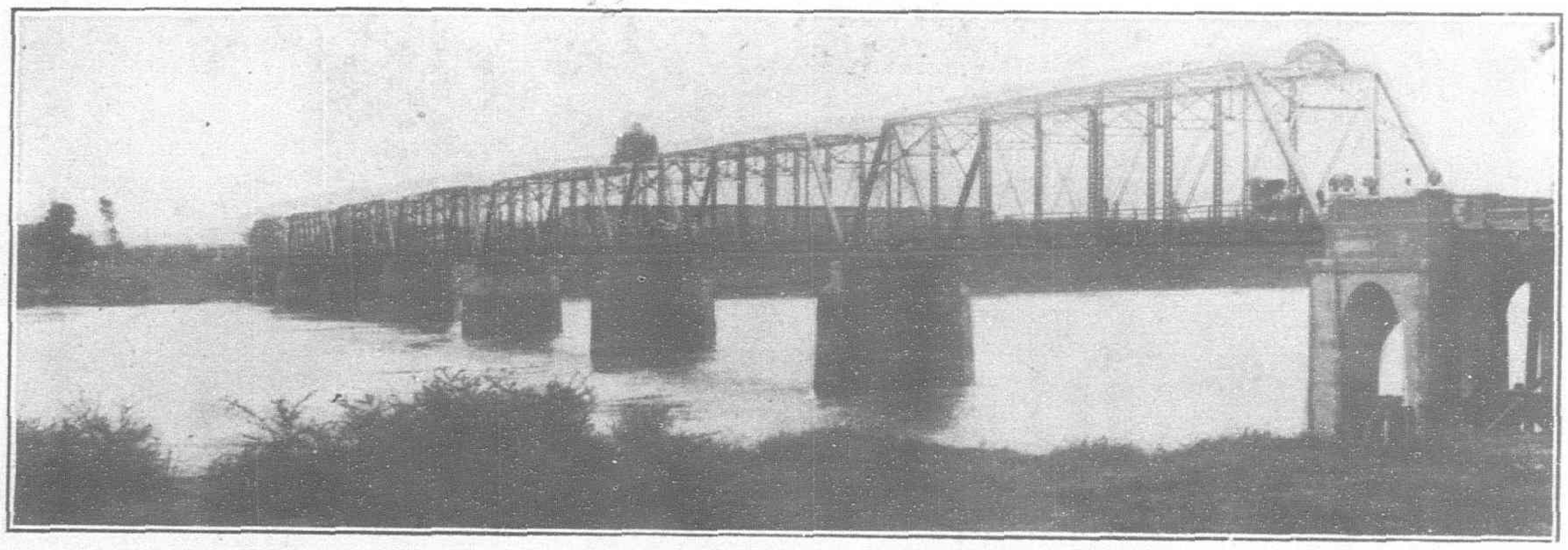
Nueva Ecija Province, Road—View of Zigzag on San Jose-Sta. Fe Road at Km. 218

Benguet Province, Road—Zigzag, Benguet Road



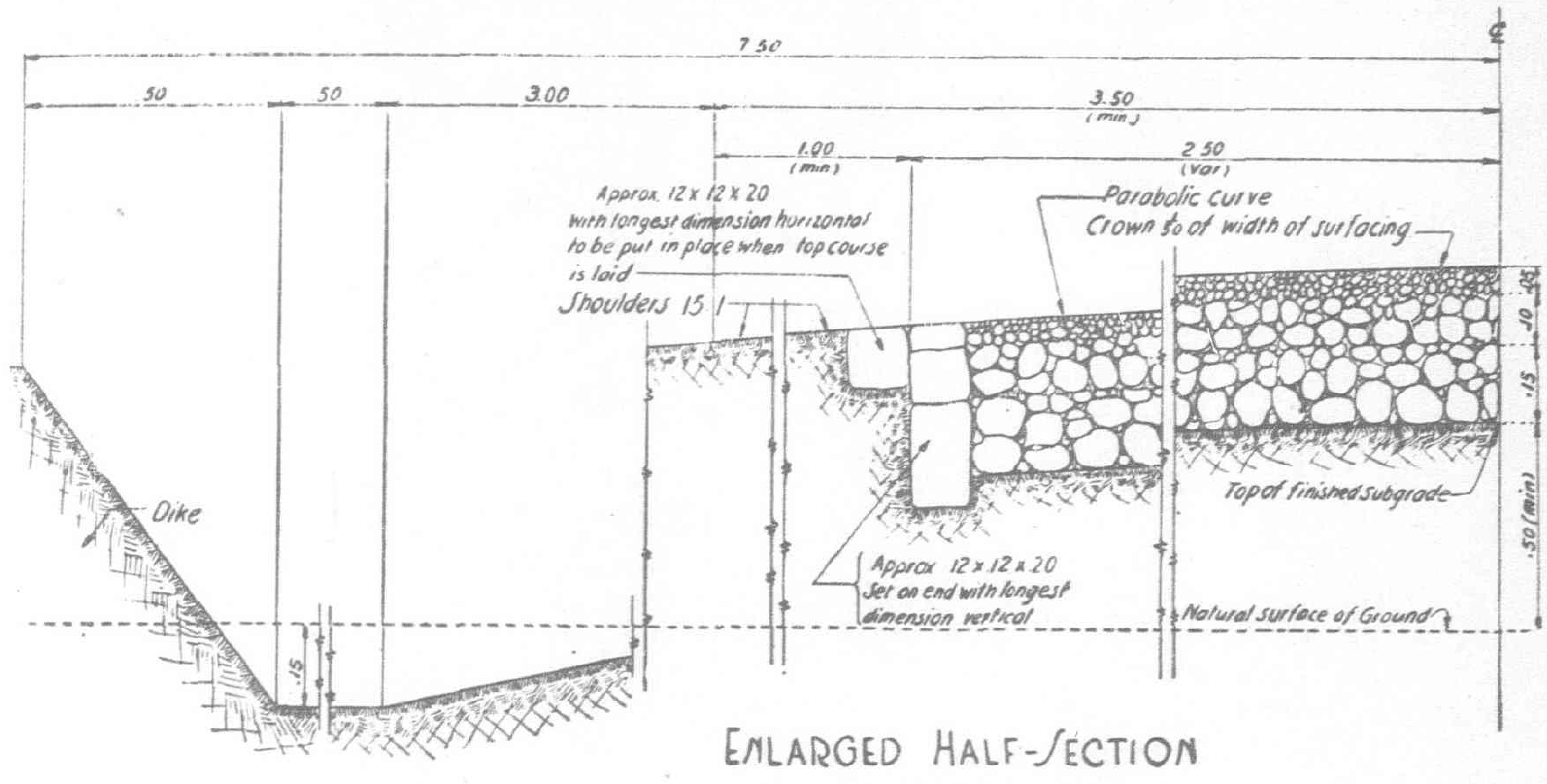
maining material when rolled will conform to the true subgrade. All excess material shall be placed in embankments, used for extending the shoulders, or otherwise deposited as directed by the Director. All this excess material shall be brought to a smooth and even surface before the final acceptance of the work.

Embankments shall be formed of earth or other approved materials. Under no circumstances shall vegetable matter be incorporated in embankments.



Ilocos Norte Province, Bridge—Gilbert Steel at Lawag

Manila, Bridge—General View of the Jones Bridge


7.50
50
50
3.00
3.50 (min)
1.00 (min)
2.50 (Var)
Approx. 12 x 12 x 20 with longest dimension horizontal to be put in place when top course is laid
Shoulders 15:1
Parabolic curve
Crown 1/50 of width of surfacing
.05
.10
.15
.50 (min)
Top of finished subgrade
Dike
.15
Approx 12 x 12 x 20 Set on end with longest dimension vertical
Natural surface of Ground

ENLARGED HALF-SECTION
TYPE "A" ROAD
Scale 1:10

An allowance for shrinkage shall be made in earth fills as follows:

Gravel or sand	10 per cent.
Clay	12 ,,
Loam	15 ,,

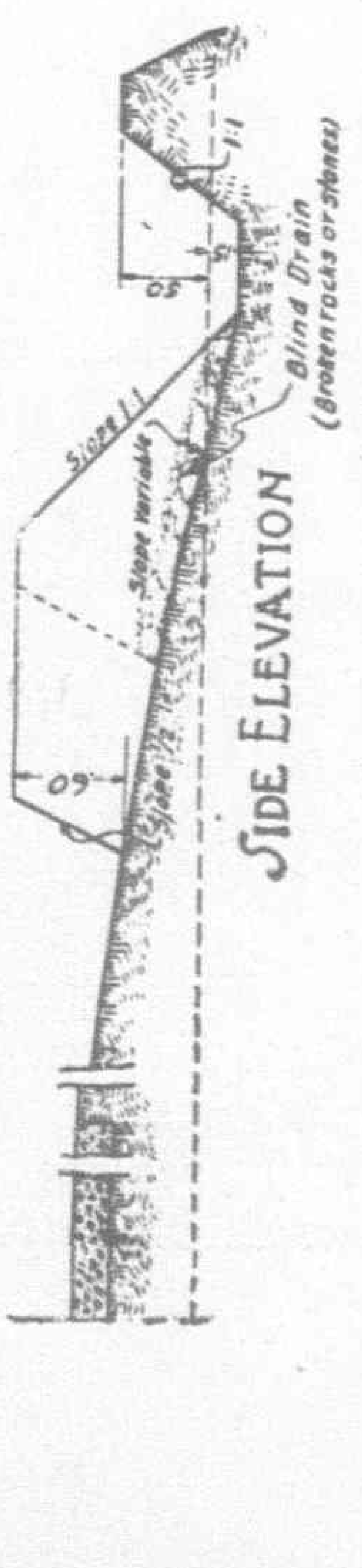
Embankments shall be built up full width from the bottom in successive uniform layers, not exceeding twenty-five (25) centimeters in thickness. Each of these layers shall be rolled until thoroughly compacted—(When the use of a ten or twelve ton roller to roll the entire embankment is impracticable, a lighter one, or heavy rammers, may be used if special permission to do so is granted by the Director but that part of the embankment over which the pavement is to be laid must be rolled with the ten or twelve ton roller). The natural surface of the ground in all side-hill embankments shall be broken by horizontal furrows or terraces sixty (60) centimeters apart before any material is placed thereon. All areas on which embankments less than one (1) foot in depth are to be placed, shall be broken up by ploughing or other means.

Borrow pits within the limits of the right-of-way shall be excavated to neat lines and shall be carried only to such depth as will permit adequate drainage by the ditch system provided.

5.—TELFORD FOUNDATION.—In places where the subsoil is unstable and of a clayey nature that will not consolidate under the action of the roller, the soil shall be removed to such a depth as may be directed by the Director. A layer of sand five (5) centimeters thick shall be spread to receive a hand-placed stone foundation at least thirty (30) centimeters thick. The stone shall be of a quality approved by the Director and of a size approximating 15 by 15 by 30 centimeters, bedded on its smallest face. All spaces, or voids, between stones shall be filled in and packed with smaller stones, and the foundation, when laid and rolled, shall conform to the finished grade of the subgrade, with the necessary crown ready to receive the metalling. The foundation shall be well rolled and consolidated, any depression that may show being filled with suitable stones as the work proceeds.

The director will indicate on the plans the sections of road where a telford foundation is necessary, and separate bids for such work will be asked for.

6.—EXCAVATION AND PLACING ROCK.—Embankments formed of stone shall be carefully placed, and all interstices filled with sand, earth, or gravel so as to form a solid and compact mass. Should it be necessary to resort to blasting, the Contractor will be required to take the necessary precautions, give proper warning, place guards at suitable places to protect the laborers and the public, and shall be responsible for all damage to adjacent property and for any accidents which may occur. Execution of work for the Government shall not relieve the Contractor of responsibility for compliance with all regulations governing the acquisition, possession and use of explosives.



SIDE ELEVATION

6a.—OVERHAUL.—If the haul on any excavated material either from cuts or from borrow pits, made in accordance with directions from the Director, exceeds one hundred (100) meters, measured along the shortest practicable line of haul from the center of gravity of the material, as found in excavation, to the center of gravity of the same material as deposited in embankment, it shall be classified as *overhaul*.

OVERHAUL shall be paid for at five centavos (5c.) per ten (10) meters of haul for each cubic meter of all material moved, measured in its original position, if taken from cuts, and in place, compacted, if taken from borrow pits.

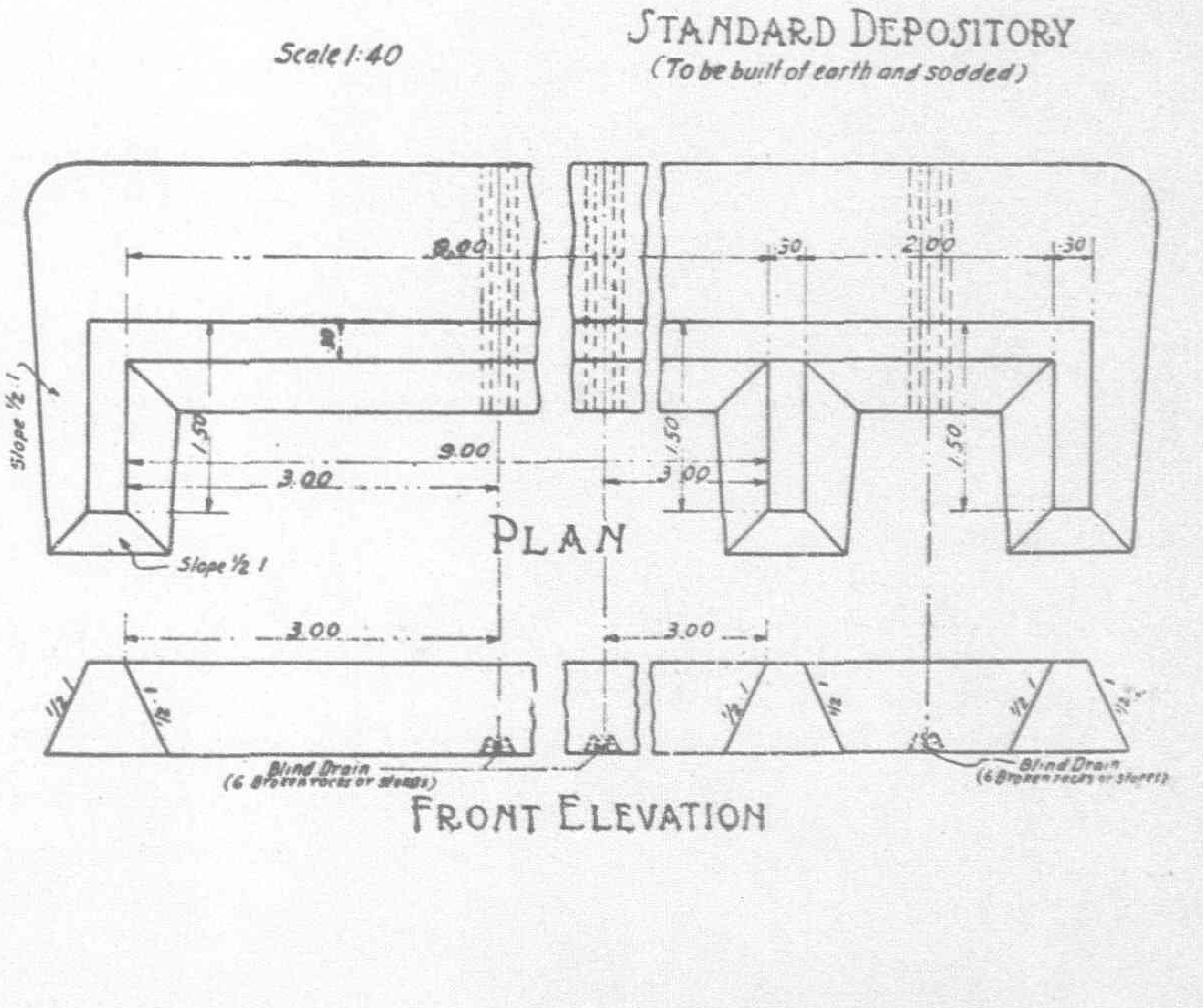
7.—ROLLING SUBGRADE.—After the surface of the subgrade has been properly shaped, and before any foundation or other surfacing material is placed thereon, the roadbed shall be thoroughly rolled and so compacted that it does not wave or spring under the roller. All muck, quicksand, soft clay and spongy material which will not consolidate under the roller shall be removed and replaced by such suitable material as the Director may direct. Care shall be taken to bring the entire subgrade to uniform density. When the rolling is completed the surface of the subgrade shall conform to the cross-section shown on the plan and shall be so maintained until the foundation or other surfacing material is in place. The Contractor shall use reasonable care to prevent tracking and rutting of the subgrade after it has once been formed and rolled. If tracks or ruts are formed, the Contractor shall scarify, re-shape and reroll the subgrade.

When a new pavement is to be constructed over an old surfacing composed of gravel or broken stone, the old pavement shall be loosened, spread to the full width of the new pavement and then thoroughly compacted, the interstices being filled with screenings, or sand, and re-rolled until a dense and uniform subgrade is obtained.

No macadam shall be laid until the subgrade has been accepted by the Director.

8.—BACKFILL.—Back-filling of all excavations that are located within the limits of the roadbed shall be made by depositing and thoroughly tamping, good, sound material in layers not exceeding fifteen (15) centimeters in thickness.

STANDARD DEPOSITORY
(To be built of earth and sodded)



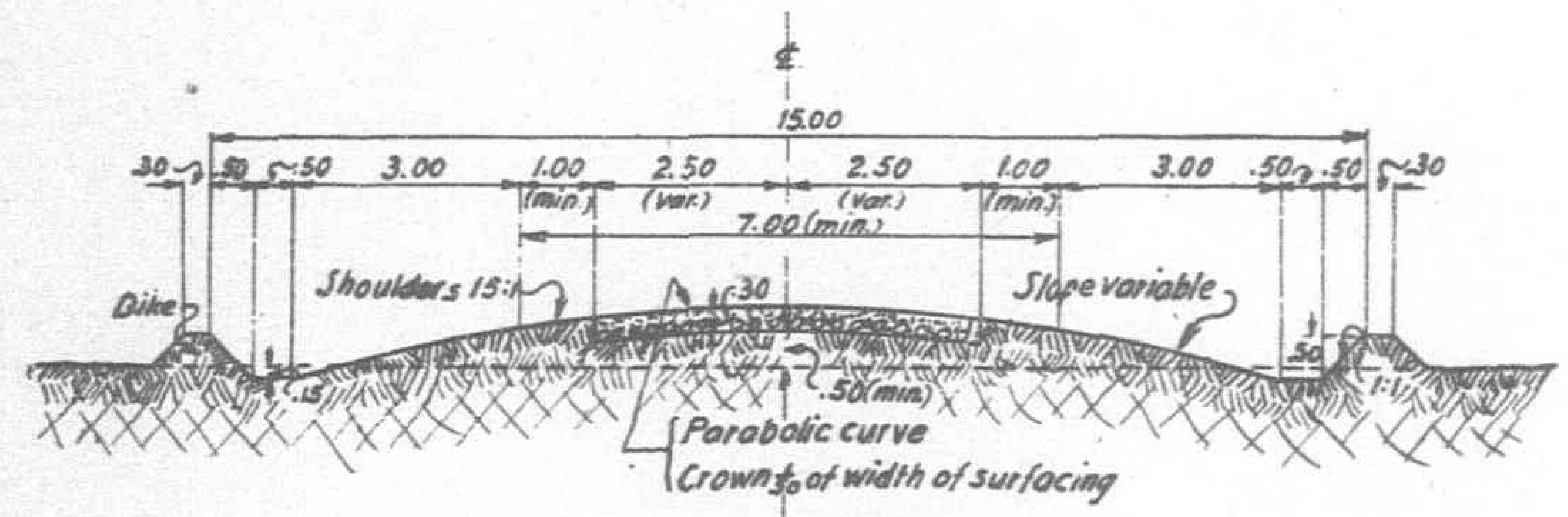
FRONT ELEVATION

9.—DRAINAGE.—Side ditches, whenever necessary, shall be kept not less than forty (40) centimeters lower than the existing road surface during all stages of the work, and the surface maintained in condition for adequate drainage.

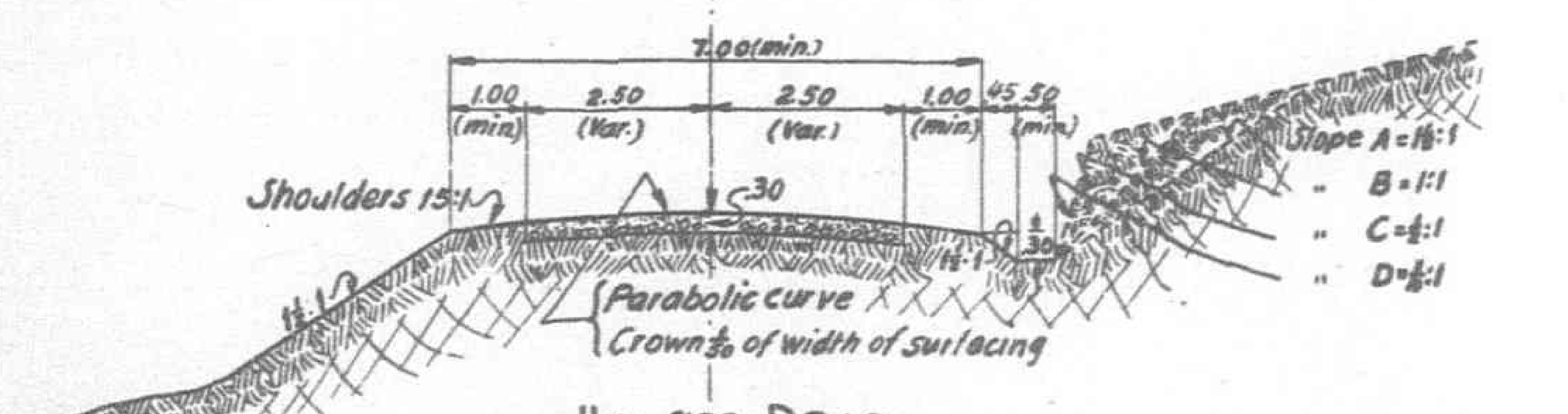
The Contractor will leave an opening in the subgrade for cross drainage wherever the construction of a culvert is contemplated, the location and dimensions of such openings to be indicated and approved by the Director.

10.—DEPOSITORIES.—Depositories shall be of dimensions as shown on plans and shall be constructed at the same time as the subgrade and shall be located at intervals as indicated by the Director, but in no case shall there be less than five (5) depositories in one kilometer.

After the road is finished and before final acceptance of the work, the depositories shall be filled with maintenance material as the Director may specify.

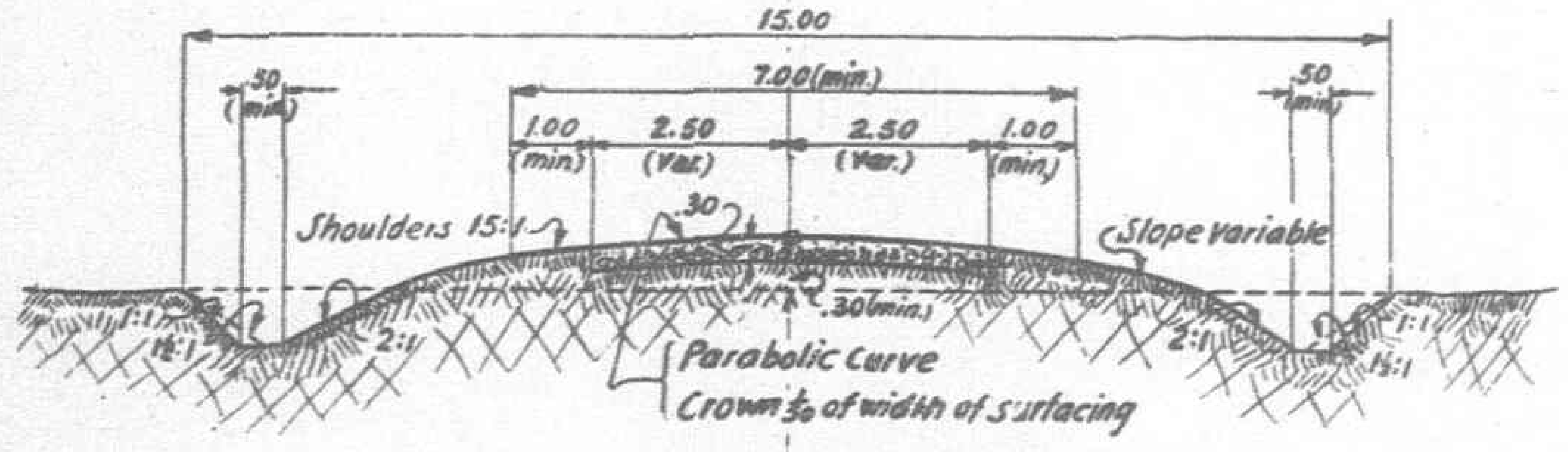


LOWLAND ROAD



HILLSIDE ROAD

Slope A is for light sandy soils, loam, etc.
Slope B is for ordinary clays
Slope C is for soft adobe, rotten shale, etc.
Slope D is for hard adobe, sandstone, solid but seamy rock, etc.
Slopes in sound solid rock may be made perpendicular



ROLLING COUNTRY ROAD

11.—BROKEN STONE AGGREGATE.—Broken stone shall be classified as to size as follows:

No. 0.—Material passing thru a 12½ centimeter opening and containing not more than 50 per cent. that will pass thru a 7½-centimeter opening and not more than 10 per cent. that will pass thru a 1-centimeter opening.

No. 1.—Material passing thru a 7½-centimeter opening and retained on a 4-centimeter opening.

No. 2.—Material passing thru a 4-centimeter opening and retained on a 2-centimeter opening.

No. 3.—(Screenings) Material passing thru a 2-centimeter opening.

12.—TYPES OF ROADS.—Roads are divided into two types depending upon the thickness of the metalling, as follows:

Type "A" having a finished metalled section of thirty (30) centimeters thickness.

Type "B" having a finished metalled section of twenty (20) centimeters thickness.

The type to be used for each particular road will be indicated on the plans.

Type "A" roads shall be laid in three courses, and Type "B" in two courses, as provided below:

The bottom course of Type "A" roads shall be composed of aggregate No. 0 and shall be fifteen (15) centimeters thick after rolling.

The bottom course of Type "B" roads shall be composed of aggregate No. 0 and shall be twelve (12) centimeters thick after rolling.

The second course of Type "A" roads shall be composed of No. 1 aggregate and shall be ten (10) centimeters thick after rolling, and the top or wearing course shall be of No. 2 aggregate and shall be five (5) centimeters thick after rolling.

The second or top course of Type "B" roads shall be composed of aggregate No. 2 and shall be eight (8) centimeters thick after rolling.

13.—PREPARING SUBGRADE TO RECEIVE METALLING.—When the subgrade has been thoroughly compacted, a trench conforming to the shape of the finished metalling shall be dug, with the depth at the sides equal to the crown of the road, and the width equal to the width of the metalling. At each side of this trench shall be placed a line of large-sized stones measuring approximately twenty (20) centimeters in their longest dimension. These stones shall be set in the ground on end, with their longest dimension vertical, to act as a support to keep the edges of the macadam from spreading under the weight of the roller. Earth fill to support these stones shall be placed behind them to the full width of the shoulders.

14.—HAULING, PLACING AND ROLLING OF METALLING.—Surfacing materials shall be hauled to and placed along the road as ordered by the Director.

The bottom course shall be spread upon the prepared subgrade and rolled dry to the thickness indicated on the plans, or as otherwise provided in the specifications. The depth of the loose stone shall be gauged by laying upon the subgrade cubical blocks of wood of the required size and spreading the stone to the same thickness. The wooden measuring blocks shall be removed before rolling is begun.

The rolling shall begin with the outside driver covering equal parts of the metal and shoulder, and the roller shall be run forward and backward along the edge of the metal until the shoulder and metal are firmly bound together. When the shoulders and the sides of the macadam have been firmly rolled, the rolling shall progress gradually toward the center from each side until the entire course has been thoroughly keyed and the interstices of the metal reduced to a minimum and all settlement has ceased. Any low places that develop during rolling shall be loosened and then refilled with the same kind of material as that of which this course is constructed and again rolled as required above. No rolling shall be undertaken when the subgrade is soft or yielding or when the rolling causes a wave-like motion in the macadam or subgrade.

Any disturbance or alteration of the surface of the bottom course shall be corrected before the next course is placed.

When a thoroughly consolidated old macadam or gravel road is to be used as a pavement foundation or as a bottom course it shall be scraped and swept clean of dirt, and mud or other accumulation. Should the surface of the old road be irregular or the depth of the metal be less than that shown on the plans or called for in the estimate, it shall be scarified and graded to a uniform surface and the required cross-section constructed by the addition of sufficient new material.

The second course in Type "A" roads shall be spread on the bottom course prepared as described above, and rolled dry to the thickness indicated on the plans, or as otherwise provided in the specifications. Cubical blocks of wood or the proper size shall be used, as in laying the bottom course, to fix the depth of the loose material. In spreading, care must be taken to preserve the grade and crown, also to prevent a wavy surface. After the stone is spread upon the bottom course, it shall be harrowed to aid in producing a uniform and even surface.

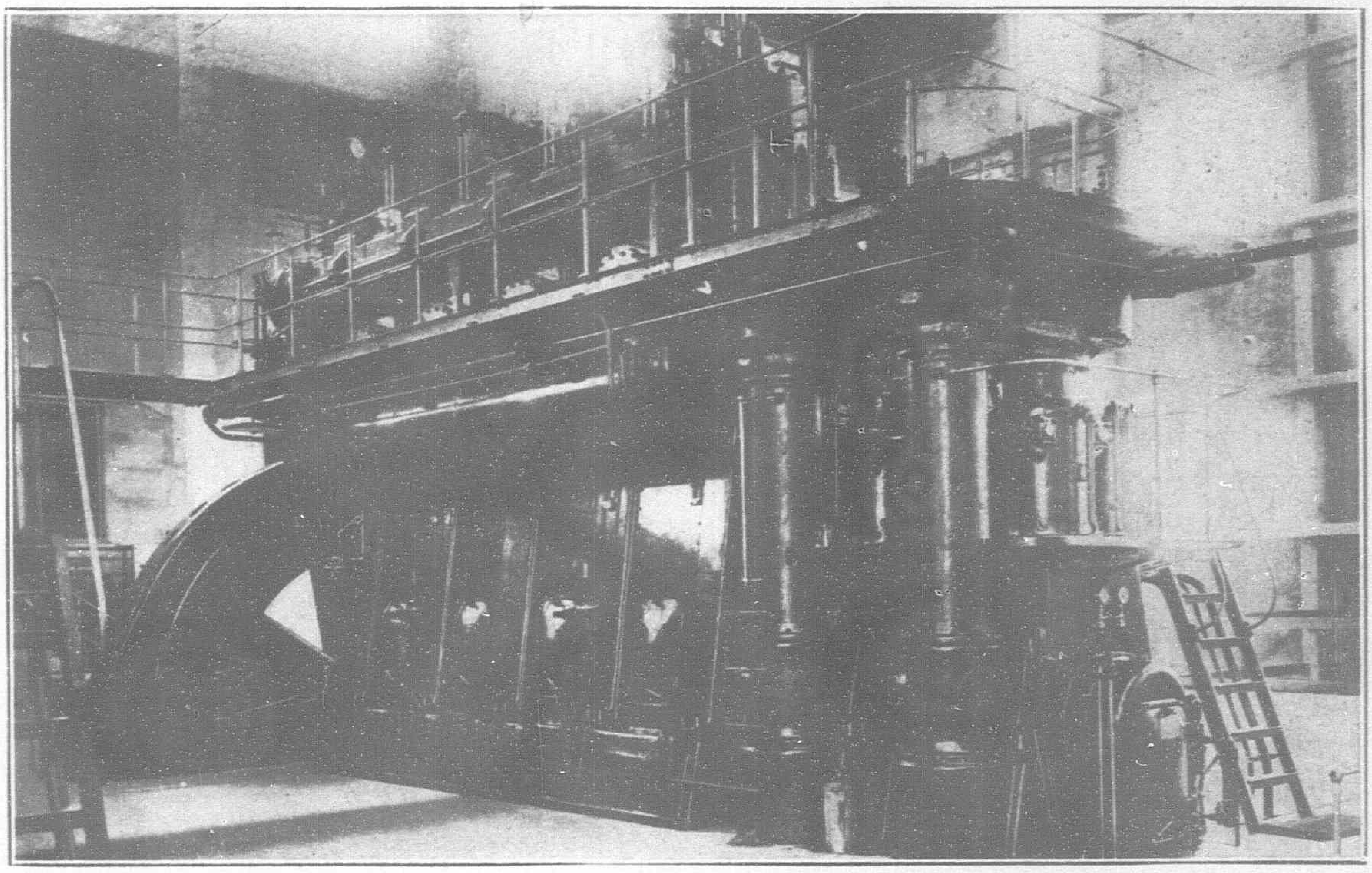
The third course in Type "A" roads and the second or top course in Type "B" roads shall be spread and prepared in the same manner as the second course of Type "A" described in the preceding paragraph. Any thin, flat or oversized stones that appear on the surface at any time during the process of construction shall be removed. Special care shall be taken to have a uniform material on the surface. All patches or areas of fine or undersized material appearing in the top course shall be removed and replaced with suitable material before final filling and water-binding.

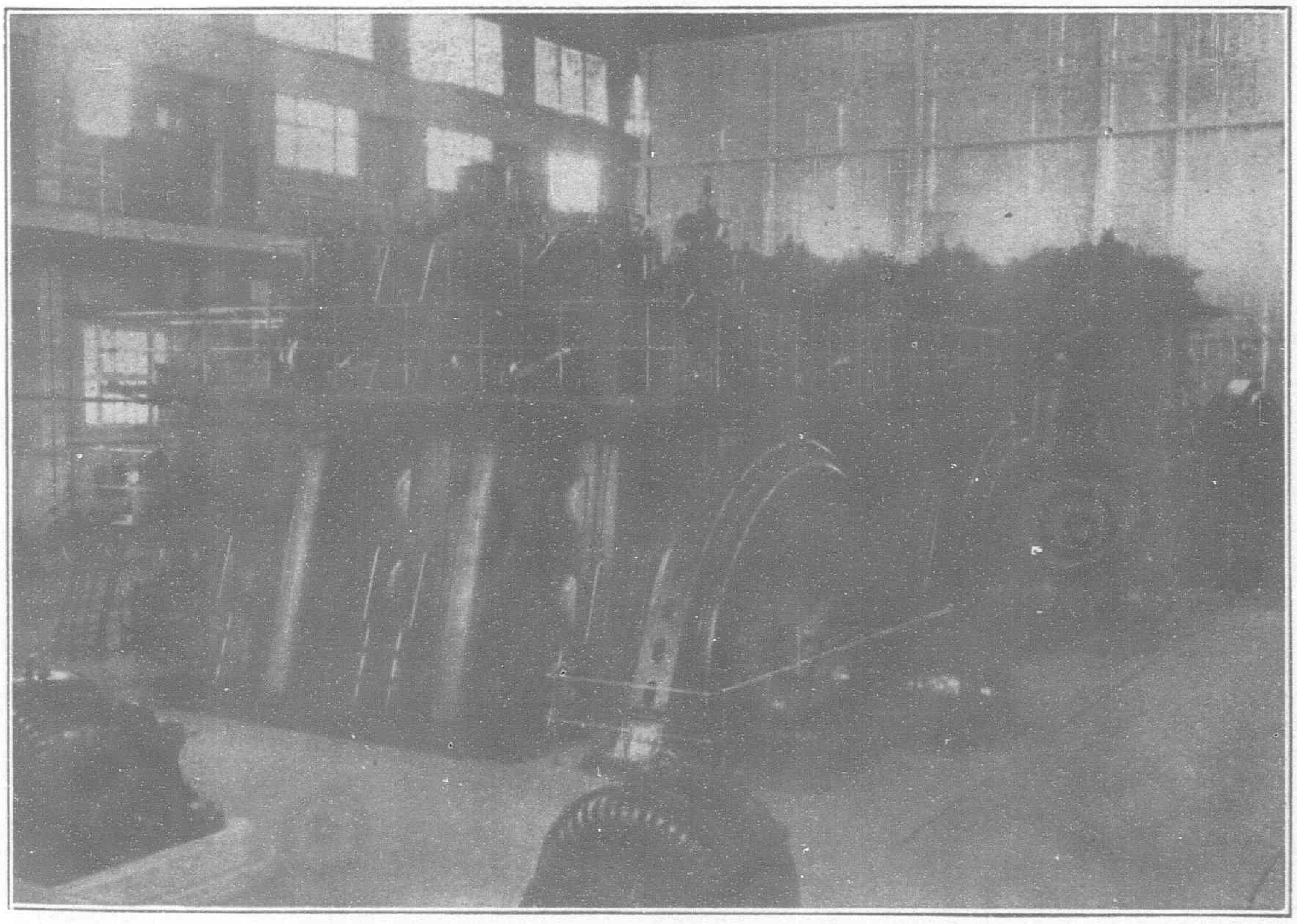
(Continued on page 36.)

The New Diesel-Electric Power Station of the Cie. Francaise de Tramways et d'Eclairage Electriques de Shanghai, Its History and Development

IN 1919, the "Compagnie Francaise de Tramways et d'Eclairage Electriques de Shanghai," which is in charge of the public works, electricity, water and tramways of the French Concession of Shanghai entered upon a series of improvements of the then existing power facilities. They were guided by the fact that the French Municipal Council and the French Consular authorities insisted that the French Concession should have an autonomous plant, situated not in Chinese territory, but within the boundaries of the French Concession. Unfortunately the latter has a very limited water front on the Whangpoo River where no vacant land was available. Great difficulty was being experienced with the small steam installation of 1,500 k.w. owing to the required quantity of water for condensation not always being available and the fact that the water, being taken from a small creek, was very muddy, and the creek was nearly dry at periods of low water.

The heavy handicap occasioned by the situation, the deplorable conditions of condensation, the impossibility of considering units of very great power, the poor quality of local coal, all combined to cause the "Compagnie Francaise de Tramways et d' Eclairage Electriques de Shanghai" to adopt the use of electric generators with internal combustion motors.





(1) One 3,600 h.p. Sulzer-Diesel Engine coupled to a Schneider Flywheel Alternator installed in the New Power Station of the Cie. Francaise de Tramways et d'Eclairage Electriques de Shanghai

(2) Two 1,500 h.p. 2 cycle Sulzer-Diesel Engines coupled to Oerlikon Flywheel Alternators, and one 3,600 h.p. Sulzer-Diesel Engine coupled to a Schneider Flywheel Alternator installed in the New Power Station of the Cie. Francaise de Tramways et d'Eclairage Electriques de Shanghai

The company therefore, decided to stop developing the old plant which was worked by steam, and to construct a new modern station, worthy of the French Concession, which is an important part of Shanghai.

General Description

The principal building of the new installation consists of a hall in reinforced concrete, with parabolic arches, 20 metres high, 25 metres wide, and 60 metres long. This hall is to hold not only the generating machines but also a substation containing rotary-converters for the transformation of current supplied to the tramway service.

The generating sets consist of two sets of 1,200 k.v.a. with Sulzer-Diesel motors and Oerlikon alternators and two sets of 3,300 k.v.a. with Sulzer-Diesel motors and Schneider alternators.

The site and the foundations for two sets of 4,600 k.v.a. are reserved at the western end of the hall, while the

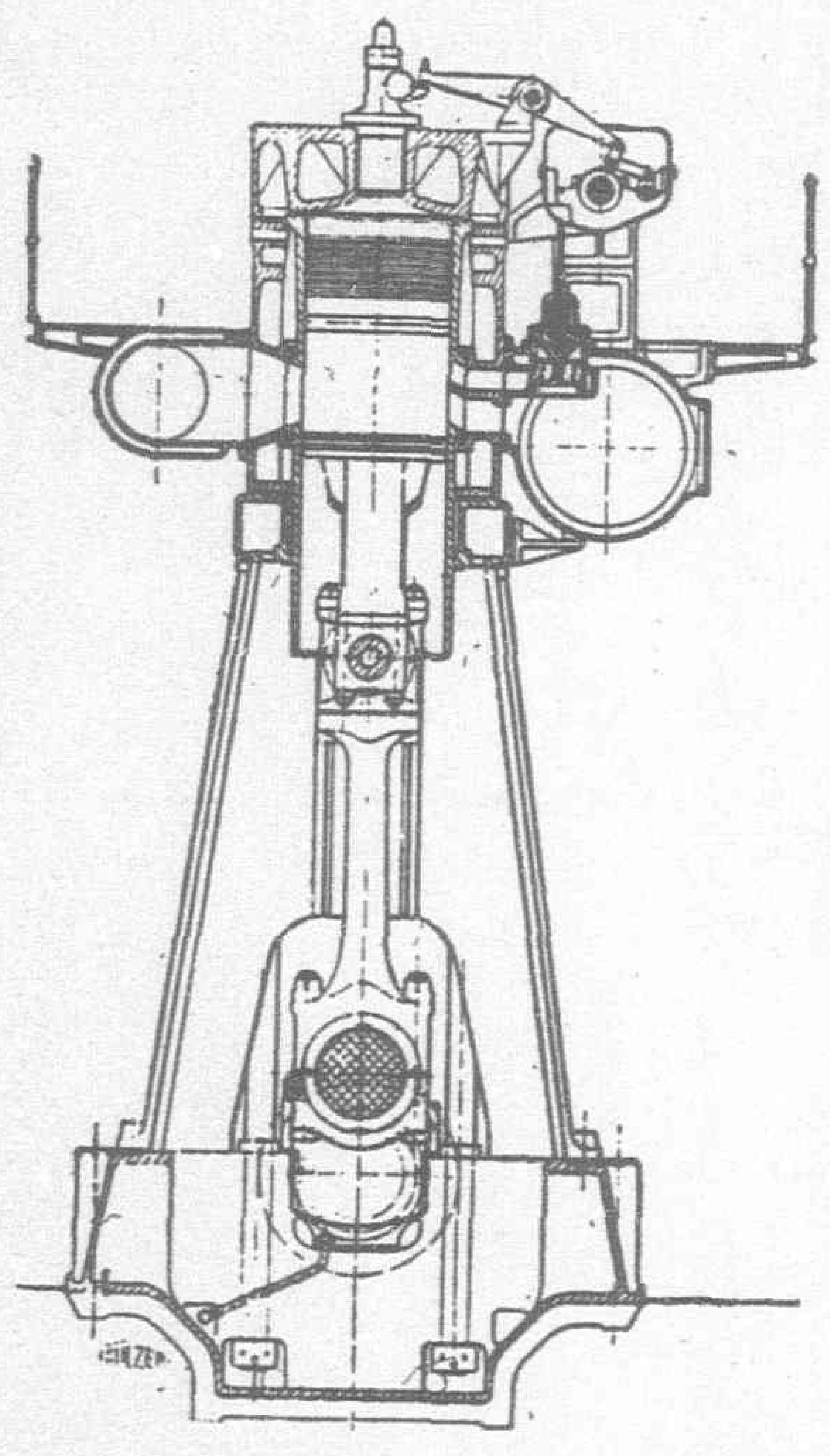


Fig. 1.—Longitudinal section of 3,600 b.h.p. Engine

opposite end is taken up by the substation. The diagram represents the general disposition of the power station and its annexes, and also shows the planned development.

On the north side running parallel to the hall containing the generating sets is a two-floor building for the switchboards and distributing apparatus. On the south side, disposed adjacent to the building are a water-tower of 400 cubic metres capacity and two refrigerators each of 200 cubic metres' capacity. Underground there are six reservoirs in concrete for holding the fuel-oil. Each of these reservoirs has a capacity of 1,100 cubic metres. The basement of the power house is taken up by the foundations of the motors and the pumps for the circulation of water and fuel. An electric travelling crane of 25 tons for moving about heavy pieces of machinery has been devised to facilitate the handling of 6,000 k.v.a. sets.

Additional ground is now available and an extension of the electric power station to a total power of 20,000 k.v.a. may be looked forward to.

Generating Sets.—The generating sets at present installed are individually, as we have mentioned before, either of a power of 1,200 k.v.a. or of 3,300 k.v.a.

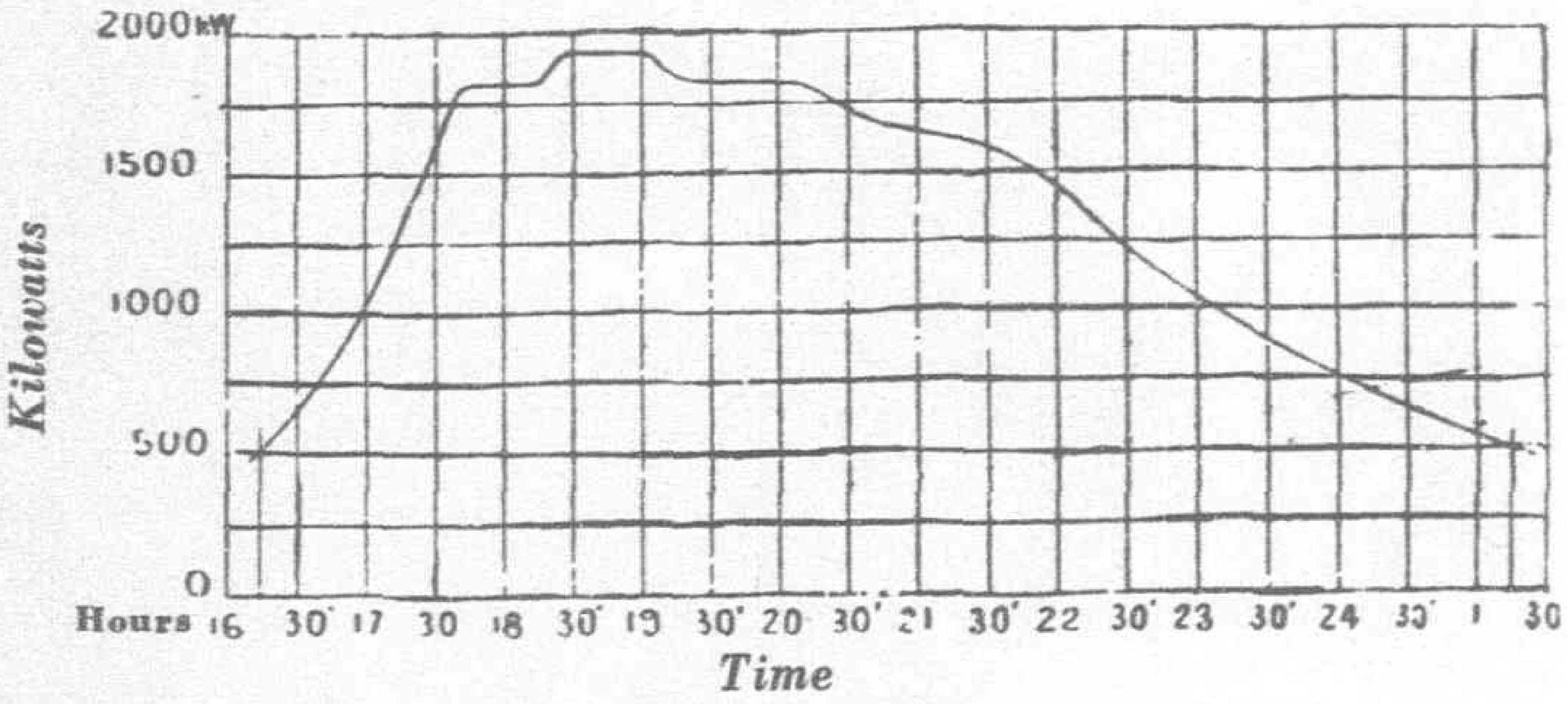


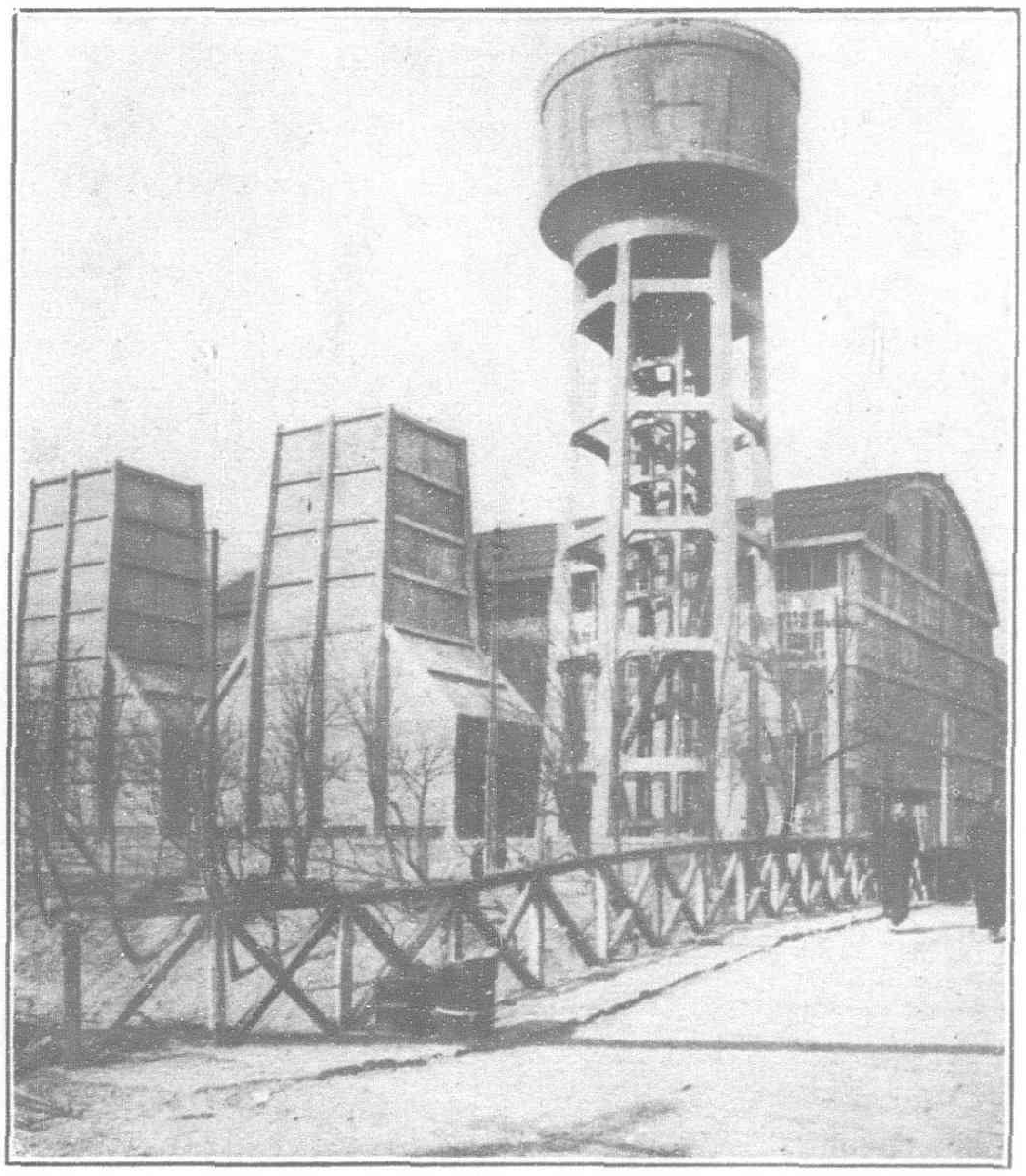
Fig. 2.—Power Station Load Diagram, 1922-23

Each generator consists of a Sulzer-Diesel motor driving a fly-wheel alternator, with the exciter mounted directly on the alternator shaft extension.

The diesel engines for driving the 1,200 k.v.a. sets, are of the 4 cylinder type running at 150 revolutions per minute. Those driving the 3,300 k.v.a. generators are of the 6 cylinder type and run at a speed of 125 revolutions per minute. All these engines work on two-cycle system, and are equipped with scavenging and supplementary air admission ports, characteristic of this type of Sulzer Diesel motors.

The two-cycle principle, with scavenging and supplementary air admission ports in the lower part of the cylinder, permits of simplification in the design of the cylinder heads and the valve gear.

The cylinder head has only one central valve-hole, into which is fitted a combined fuel and injection-valve, which renders possible the making of the cylinder head in a single simple casting of symmetrical form, of great strength and with ample and regularly disposed cooling-water spaces, therefore resulting in a head which is subject only to uniform strains.



The New Power Station

The piston is made in two parts. It is cooled by water led through telescopic tubes, the disposition of the joints preventing same from being effected by the hot gases. The lower part serves to open and close the scavenging and exhaust ports. The piston is lengthened at this crosshead, the transverse reaction set up by the connecting rod is not thrown on the piston, but is taken up by two guides which are largely dimensioned and well lubricated. The lubrication of the gudgeon pin is assured by a special lubricating circuit employing telescopic tubes.

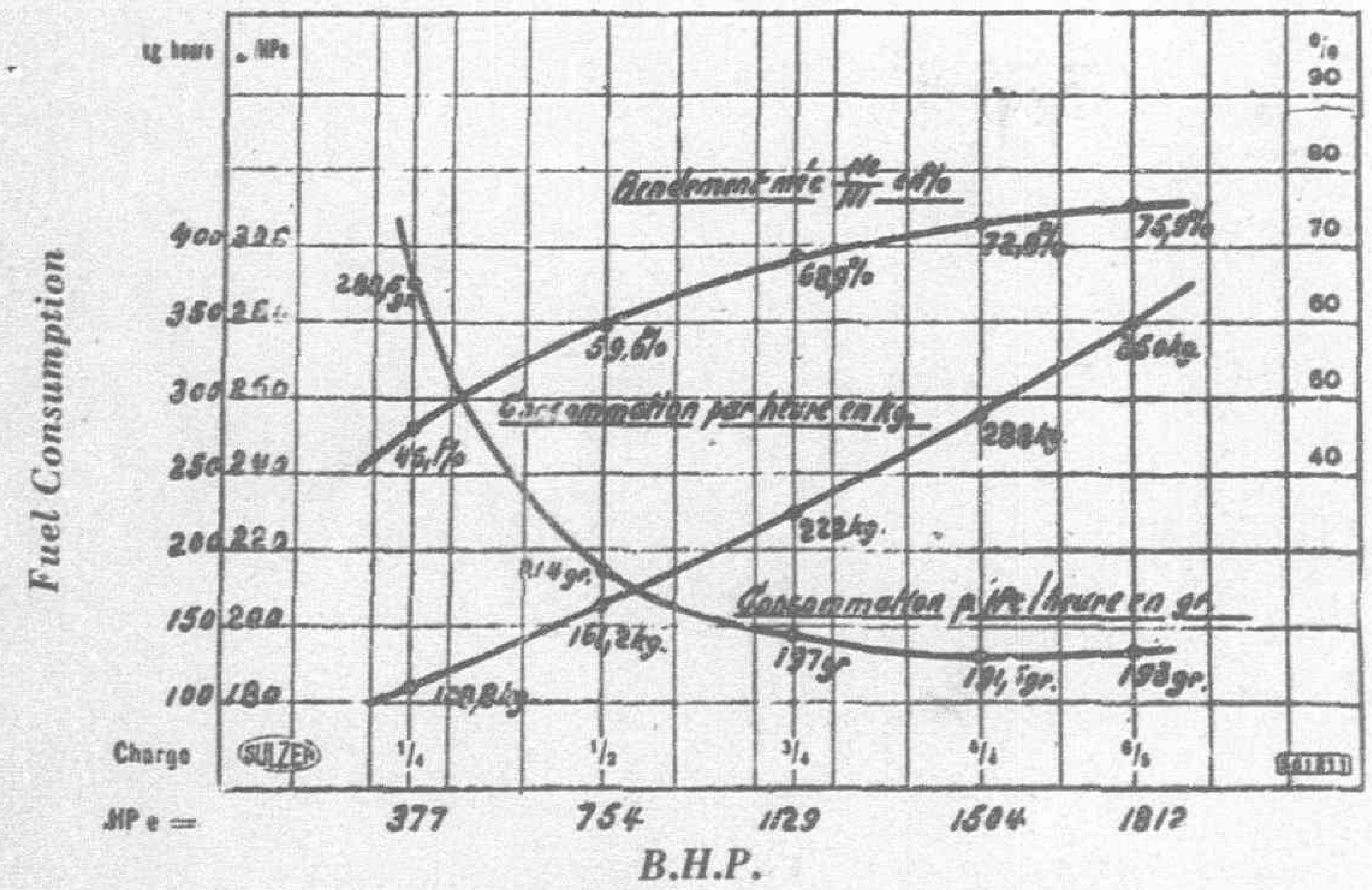


Fig. 3.—Test Curves for Fuel Consumption of 1,200 k.v.a. units

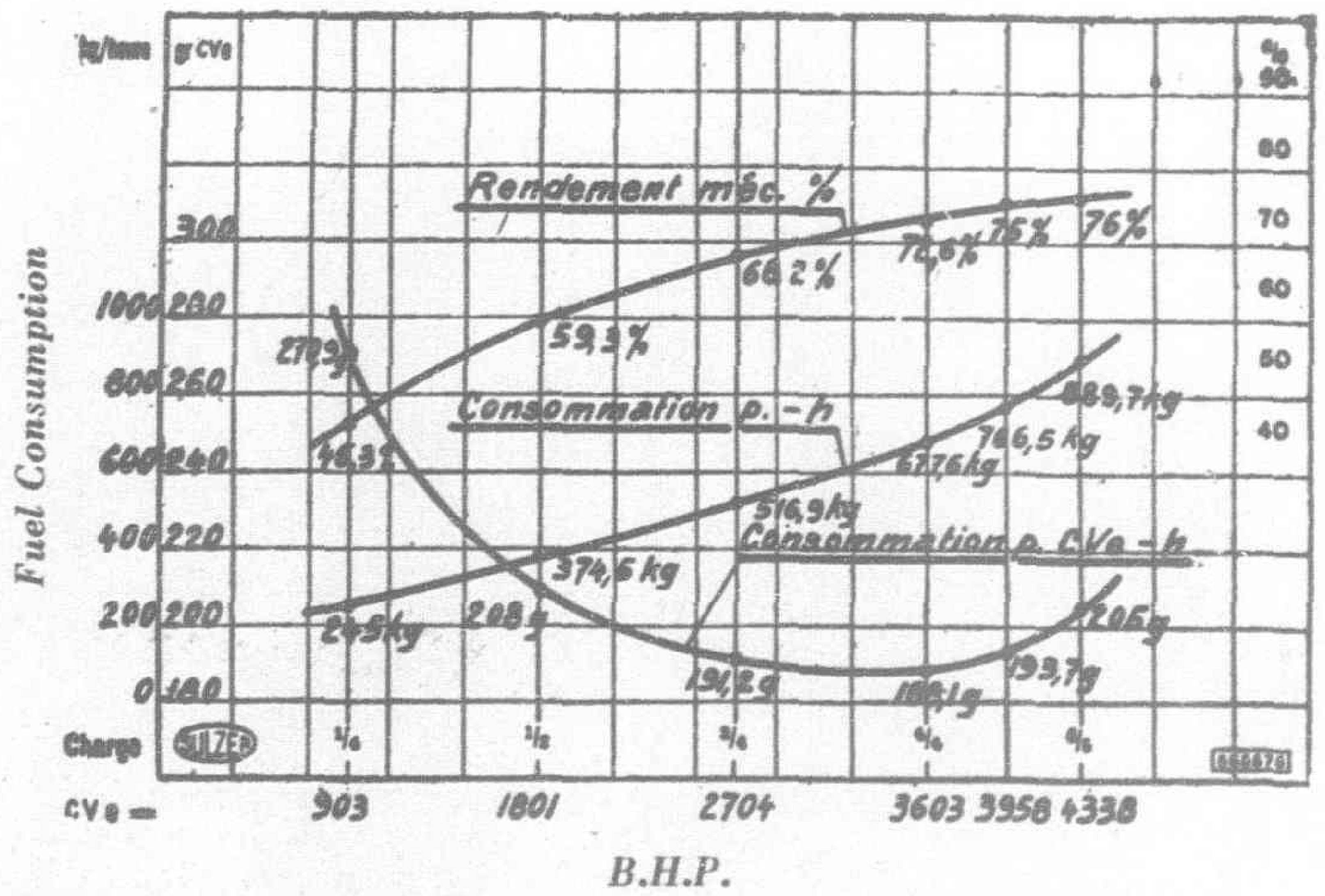


Fig. 4.—Test Curves for Fuel Consumption of 3,300 k.v.a. units

The exhaust is effected through a row of ports of wide sections, uncovered by the piston in the lower part of its downward course and putting the interior of the cylinder into direct communication with the exhaust gas collector.

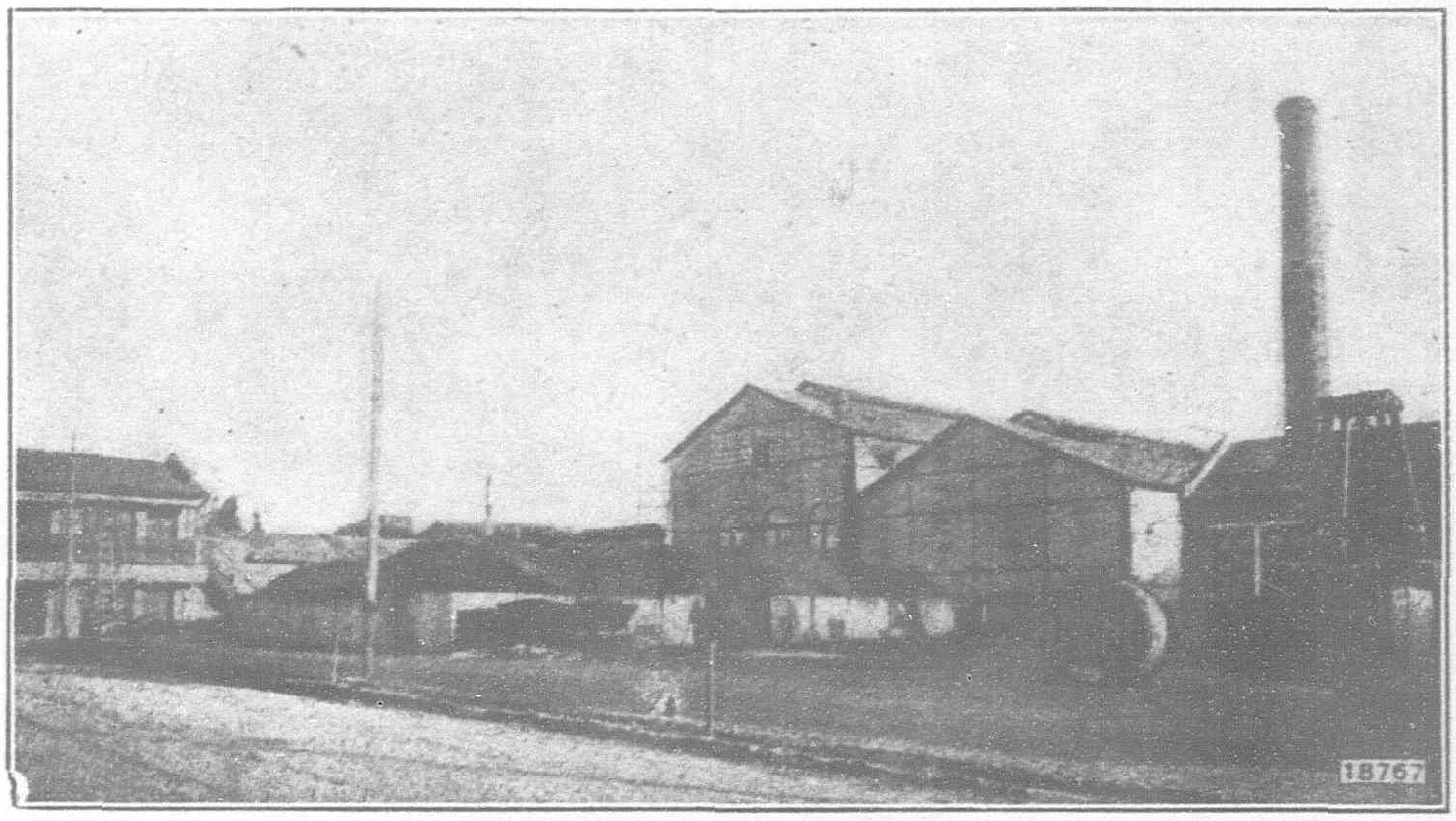
The scavenging and the admission of supplementary air are worked on the Sulzer principle by two rows of ports in the right side of the cylinder, (Fig. 1). The upper row of ports is controlled by a valve ; the lower row, in free communication with the expelled air collector, permits the entrance of fresh air into the cylinder when the piston uncovers these openings, that is to say only after the beginning of the exhaust.

The air is expelled by the scavenging pump at a low pressure, the disposition of the motor offering only a minimum counter-pressure. In the upward stroke, after the piston has closed the exhaust ports, the valve controlling the upper row of exhaust ports, remains open, and hence the introduction of fresh air into the cylinder continues till it attains a pressure approximatively equal to that contained in the scavenging air collector.

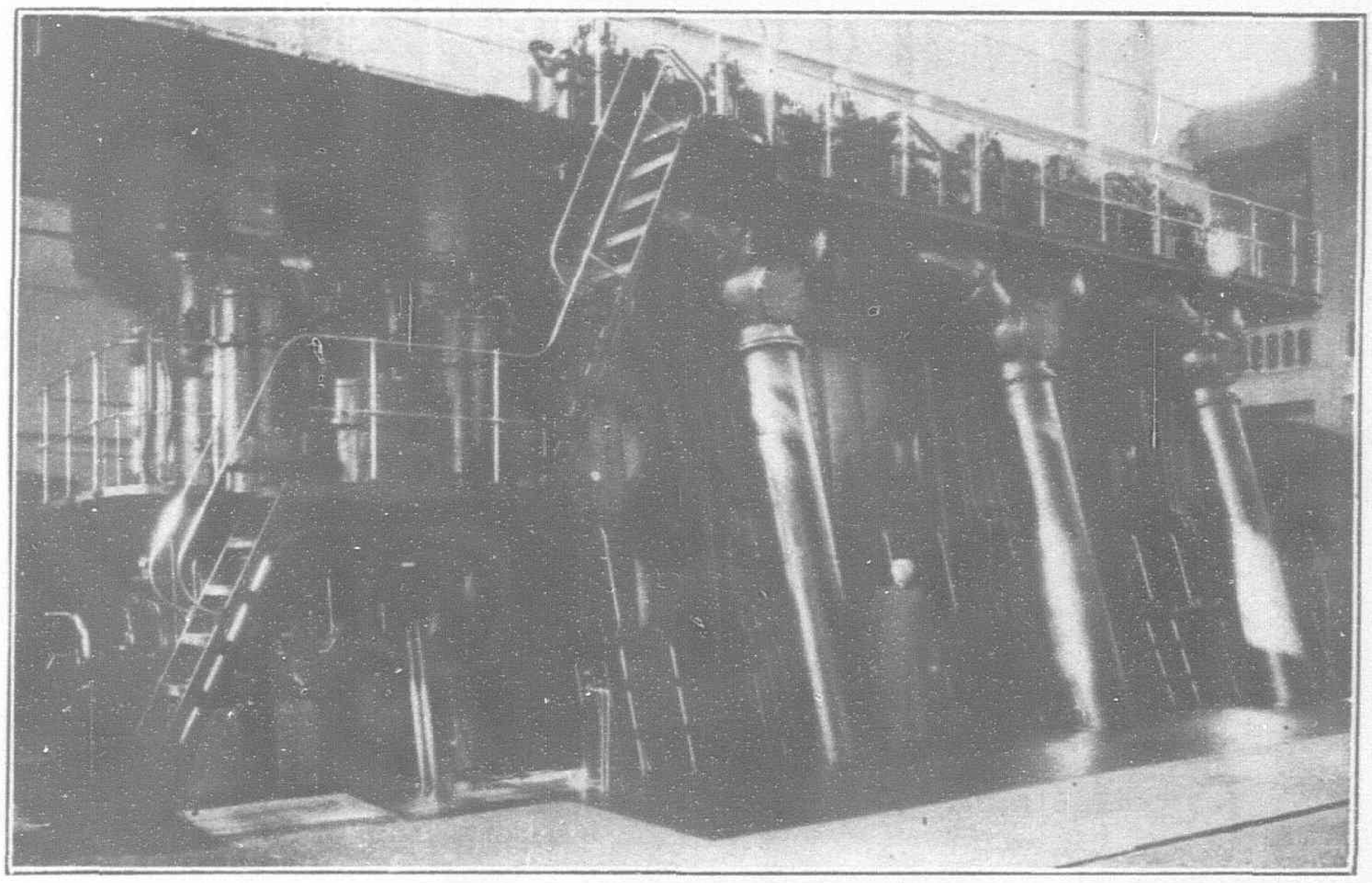
The temperature in the cylinders, and specially in its lower part, on a level with the ports, is much lower than one would generally expect : it is perceptibly lower than that of a superheated steam engine.

The advantage of a design of cylinder-head with a central opening, on the one-hand, and on the other hand the use of a two-cycle motor, permits the attainment of a power theoretically double that of a four-stroke cycle of the same cylinder capacity ; the difficulties in construction, both purely mechanic, and thermic, are thus diminished. These are the different reasons which have led the constructors to adopt the two-stroke cycle for land engines, above a certain power per cylinder.

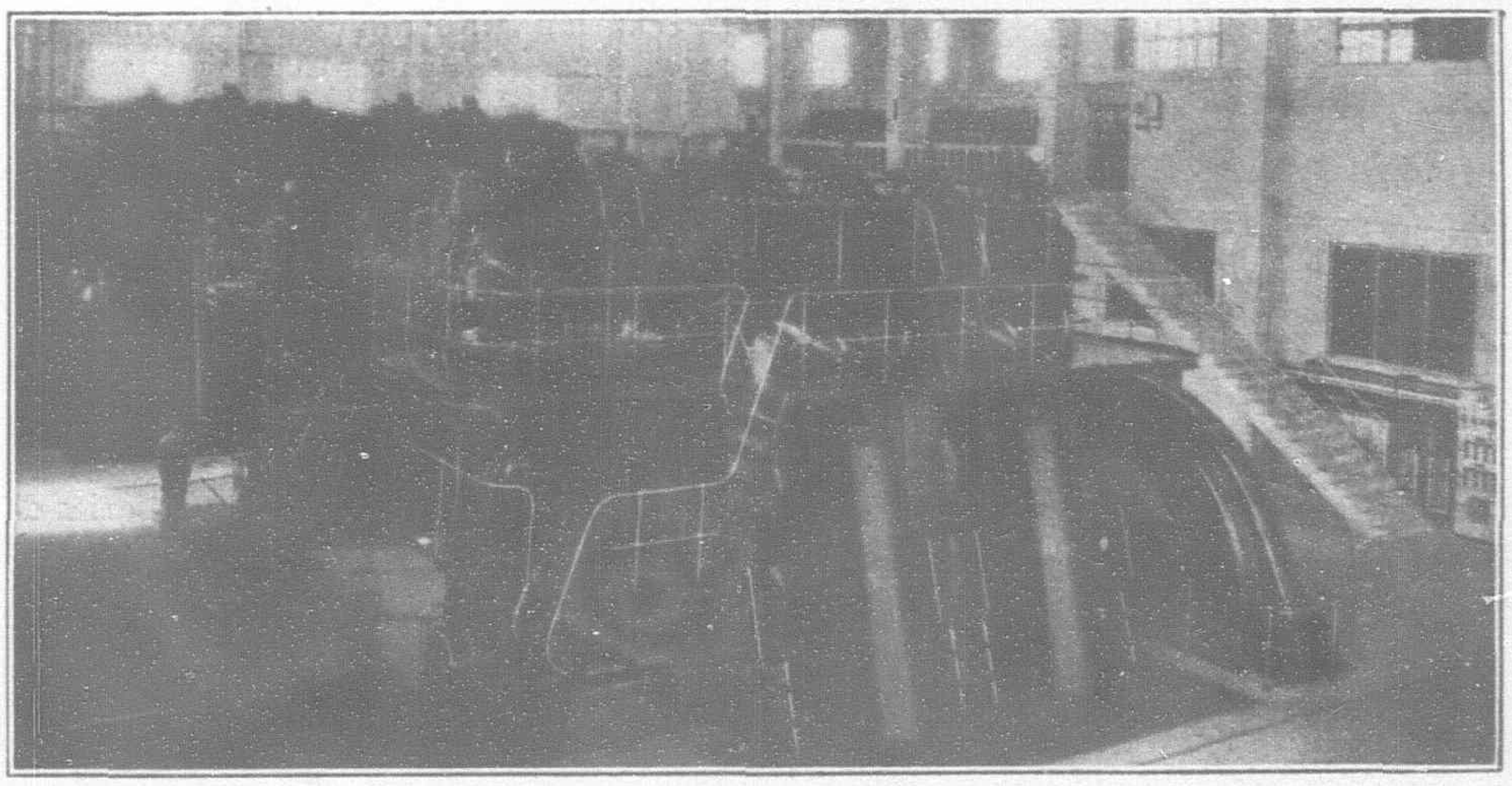
Besides, this type of engine is particularly adapted to heavy fuel, such as Mexican oils, without using lighting oil.



The Original Power Station



3,600 b.h.p. 2-cycle Sulzer-Diesel Engine



2 by 1,500, 1 by 3,600 b.h.p. 2-cycle Sulzer-Diesel Engines.

We shall not enlarge upon the other mechanical dispositions of these engines and shall only mention the regulator. It acts automatically, not only as regards the quantity of fuel admitted, but also with respect to the different factors of regulation and combustion as regards both length of time and intensity. It is of the axial type, and, being on ball bearings, the friction is reduced to a minimum ; and the extremely slight delay in distribution assures an excellently regular functioning, under stable conditions as well as with rapid variations of charge.

It is, of course, necessary that the usual other mechanical and electrical precautions be taken.

The units, whatever their power, are set working in a few seconds by means of compressed air kept in bottles which are filled by the compressors of the motors. There is an auxiliary set to which recourse can be had in case, if by any accident, the air kept in reserve fails.

The electric parts of the different sets are composed in the following manner :

For the 1,200 k.v.a. sets : flywheel alternators by the "Société Oerlikon," voltage 5,500 volts, of a frequency of 50 periods, directly mounted on the shaft of the motors, turning at a speed of 150 revolutions per minute.

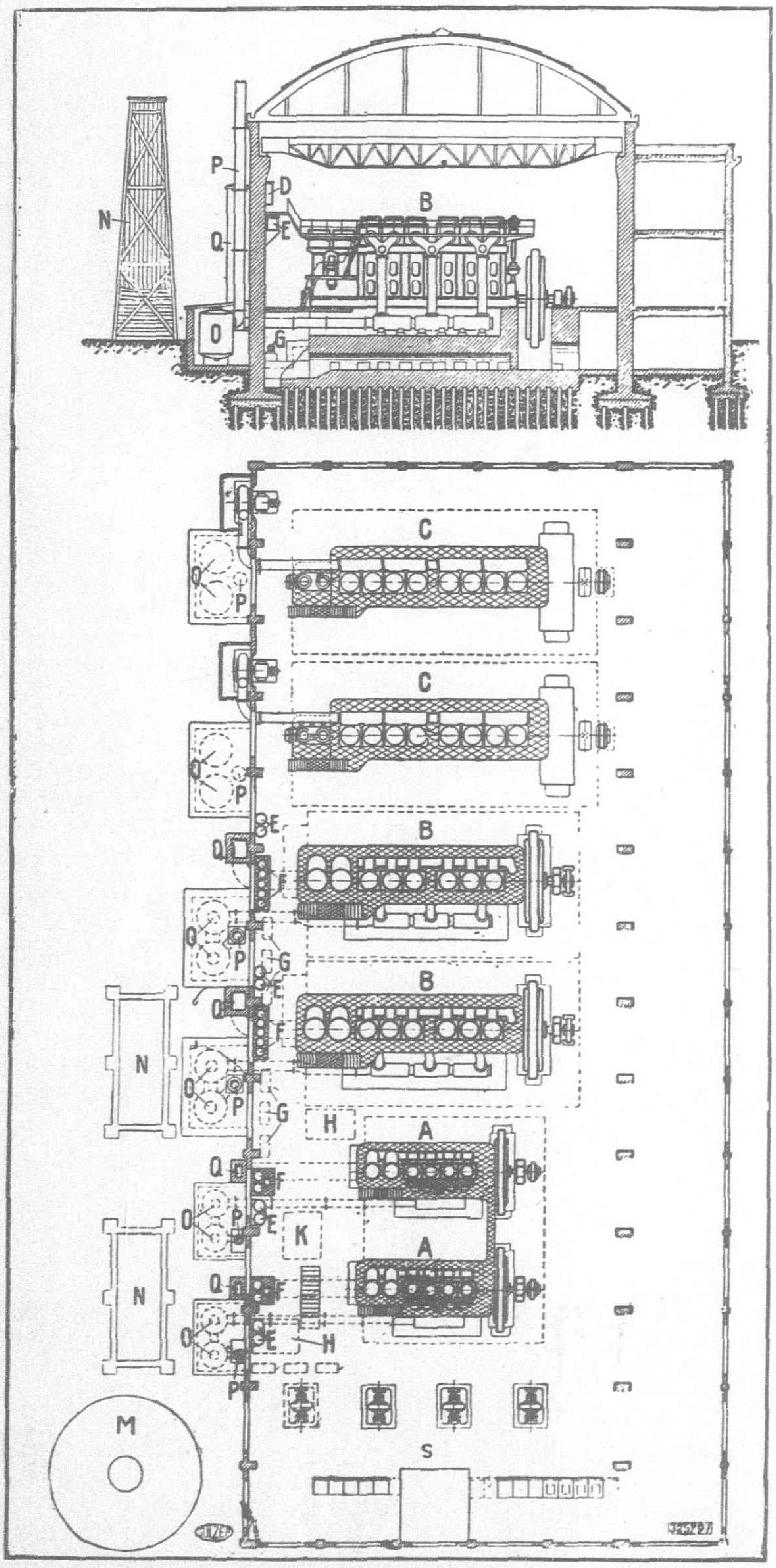
For the 3,300 k.v.a. sets : flywheel alternators by Schneider & Co., voltage 5,500, frequency 50 periods, directly mounted on the shaft of the motors, turning at a speed of 125 revolutions per minute.

Rotary-Converters.—At the end of the engine room is a sub-station comprising 3 rotary-converters by Schneider, each of 350 kilowatts, capacity, converting to continuous current the equivalent of approximately 1,500 h.p. for supply to the tramways. The addition of a fourth converter is projected.

Distribution Board.—Along the north side of the hall is a two-floor annex, in which are installed the panels controlling the alternators, with the high tension controlling and distributing apparatus. This apparatus possesses every desirable perfection and safety device. Voltage regulators (Thury system) are placed in the exciter circuits, so as automatically to regulate the voltage.

Auxiliary Services.—These services are composed principally of apparatus for the circulation of the water for the cooling system and the fuel, from the cisterns where the same is stored.

The water, passing through a system of cooling refrigerators, circulates in a closed circuit, thus permitting the recovery of the water, of which the supply is very limited.



Transverse section and plan of the new power station at Shanghai, installation of Sulzer-Diesel motors

A, 1,200 kilovolt-ampere sets;
B, 3,300 kilovolt-ampere sets;
C, 4,600 kilovolt-ampere sets;
D, fuel reservoir;
E, fuel receptacle;
F, compressed-air bottles;
G, sets of electric motor-driven pumps;
H, tank for receiving the overflow water used for cooling the pistons;
K, tank for hot water;
M, water-tower of 400 cubic metres capacity;
N, cooling towers of 200 cubic metres capacity each;
O, silencers;
P, exhaust pipes:
Q, scavenging air inlet;
S, rotary-transformer substation.

The circulation of the water and the supply of fuel are effected by means of Sulzer centrifugal pumps, installed in the basement of the power station.

Conditions and Results of Tests

The two first generating sets of 1,200 k.v.a. have been working since November 1922; the 3,300 k.v.a. set, since October 1924; and a second 3,300 k.v.a. set was officially placed into commission on December 2, 1925.

The sets which have been working for the last three years have proved highly satisfactory. These sets have been functioning continually, since 1922, at an average of about 65 per cent. of their maximum load. Under these conditions, the fuel oil consumption is about 0,310 kgs. per kilowatt-hour.

The Chinese staff of workers, taught by the constructors' installing engineers and by the agents of the Company, keep the service in good order, only a few men being necessary.

On account of the small number of hands required for the working of the power station, the functioning of the generator, in cases of emergency—of a strike for example—can be carried on by only the European staff.

The load diagram for the power station, at the end of 1922 and at the beginning of 1923, is given by figure 2. As has previously been said, at an average load of 65 per cent., the consumption of 310 grams per kilowatt-hour corresponds to less than 200 grams per horsepower, a remarkable figure for the load considered, and agreeing with results of the tests made in the power station indicated by figure 3.

The Diesel motors have a special advantage: the consumption of fuel functions perfectly while the machines are running, and this independently of the degree of cleverness of the personnel, which is contrary to what happens in the case of a power plant run by steam.

In addition figure 4 gives the results of the tests made on the first motor of 3,300 k.v.a.

In conclusion: the motors are provided with special apparatus for the heating of the fuel pipes, which permits the use of very viscous oils, such as the Mexican, thus increasing the possibilities and facilities of obtaining supplies and of storing same.

Trial Trip of B. I. Steamer "Quiloa"

Another new steamer, the *Quiloa*, recently constructed by Messrs. William Gray and Co., Ltd., of West Hartlepool, to the order of the British India Steam Navigation Company, Ltd., successfully ran her official trial trip towards the end of October. The vessel is of the following dimensions:—Length, overall 502 feet; breadth 60 feet 9 inches; depth moulded 32 feet 8 inches. She has ample accommodation for a few passengers, and for officers and crew, is fitted with wireless telegraphy, and has an electric light installation throughout. The outfit includes an ice house for provisions, fresh water distiller, steam windlass, and steam steering gear aft, with telemotor control on bridge, cellular double bottom, deep ballast tank, fore and aft peak tanks, 18 derricks fitted on masts and derrick uprights, one 25-ton derrick, 19 steam winches exhausting into a winch condenser.

The propelling machinery, supplied by the Central Marine Engine Works of the builders, consists of balanced quadruple engines having four cylinders, 28½ inches, 41 inches, 58½ inches, and 85 inches diameter by 54 inch stroke, with 5 large multitubular boilers working at 225 lbs. pressure.

A number of steamship auxiliaries of the well-known "CMEW" type, also made by the Central Engine Works, are fitted, including centrifugal pump, pair of main feed pumps, general service pump, ballast pump, sanitary pump, fresh water pump, harbour feed pump, ash ejector pump, direct contact feed heater, evaporator, auxiliary condenser, and auxiliary surface feed water heater. The refrigerating plant installed has been supplied by Messrs J. & E. Hall, Ltd., of Dartford.

The International Bridge at Tientsin

THE following report on The International Bridge at Tientsin is of general interest and is here given in full as an indication of the type of bridge desired in North China :

In my report on the future improvements of the Hai Ho, I had occasion to recommend the reconstruction of the International Bridge on more suitable lines and I suggested the adoption of one of the bascule types.

In an international tender, however, we had to give full liberty to the manufacturers and designers to recommend the type they thought most suitable for the purpose.

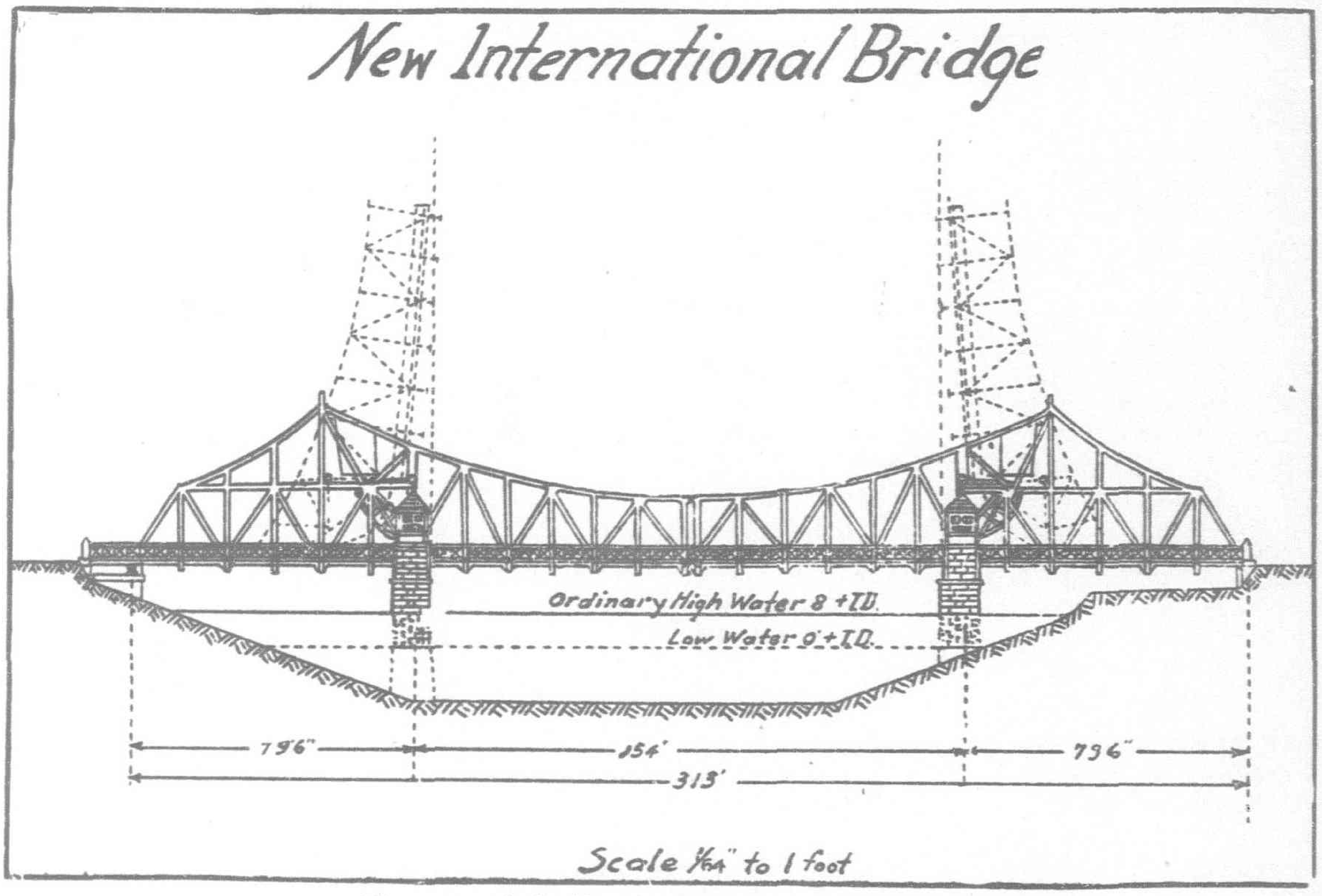
The projects received were 31 from 17 Firms divided as follows :

Double leaf rolling lift Scherzer type	5 projects
Double leaf Strass Bascule type	7 ,,
Vertical lift Waddell type	11 ,,
Other Bascule types	8 ,,
	31 projects

The Scherzer rolling lift bridge is a type of rolling lift bridge of which the mobile leaf of the bridge and the counterweight form a whole. When opening, it rolls backward on two cogged racks moving inland so as to clear the space above and beyond the pier.

The centre of gravity of the system moves horizontally and parallel to the cogged racks in the same way as a roller moves horizontally in contact with the ground.

In the Strass Bascule type, when opening, the leaf is supported by trunnions around which it rotates and the counterweight acts on the leaf by means of a parallelogram formed by strong arms.



The accepted plan for the New International Bridge

In this system the leaf is also equilibrated by the counterweight, but, when open, the leaf does not clear the space above and beyond the pier.

The Vertical Lift, Waddell Type, is a simple arrangement : the whole rigid mobile span is lifted vertically, by means of cables, between two towers over the river piers.

The rigid span is balanced by counterweights and it rises above the level of the top of the masts of the steamer, other bascule types submitted are the Zimmermann Type, which is a modification of the Scherzer Type : The Orr. Watt & Co., design which is a modification of the Strass Type, and some other single leaf bascule types.

Road Traffic

As far as road traffic is concerned, all the designers elected to build the bridge in accordance with the Specification, and the live loads, enumerated therein, were admitted. The Waddell design, consisting of a rigidly built span, should be preferred to the two leaf types in this respect, but, as hundreds of the latter type have given satisfactory service for many years and have been subjected to heavier loads, there is no objection to the bascule types in so far as road traffic is involved.

River Traffic

River traffic is the most important question to be considered in selecting a design of bridge suitable for our local conditions. The first desiderata is that the fairway should be cleared both as far as possible and as quickly as possible.

Selection of the Convenient Type

The designs submitted can be divided in two classes :

(*a*) Vertical Lift
(*b*) Bascule ,,

The author of the first type, comparing his design with the bascule types claims the following advantages :

I. The floor is always horizontal, permitting the use of a block pavement, which cannot be attained on a bascule.

II. Great wind pressure during operation has no appreciable effect on a vertical lift, while it may cause serious delay to a bascule or even, under extreme conditions, altogether prevent its operation.

III. The vertical lift does not have to rise so high for low masted passing craft as does the bascule, and thus it saves a small amount of time.

IV. For railroad traffic the vertical lift is the most rigid of the bascule and swinging bridges.

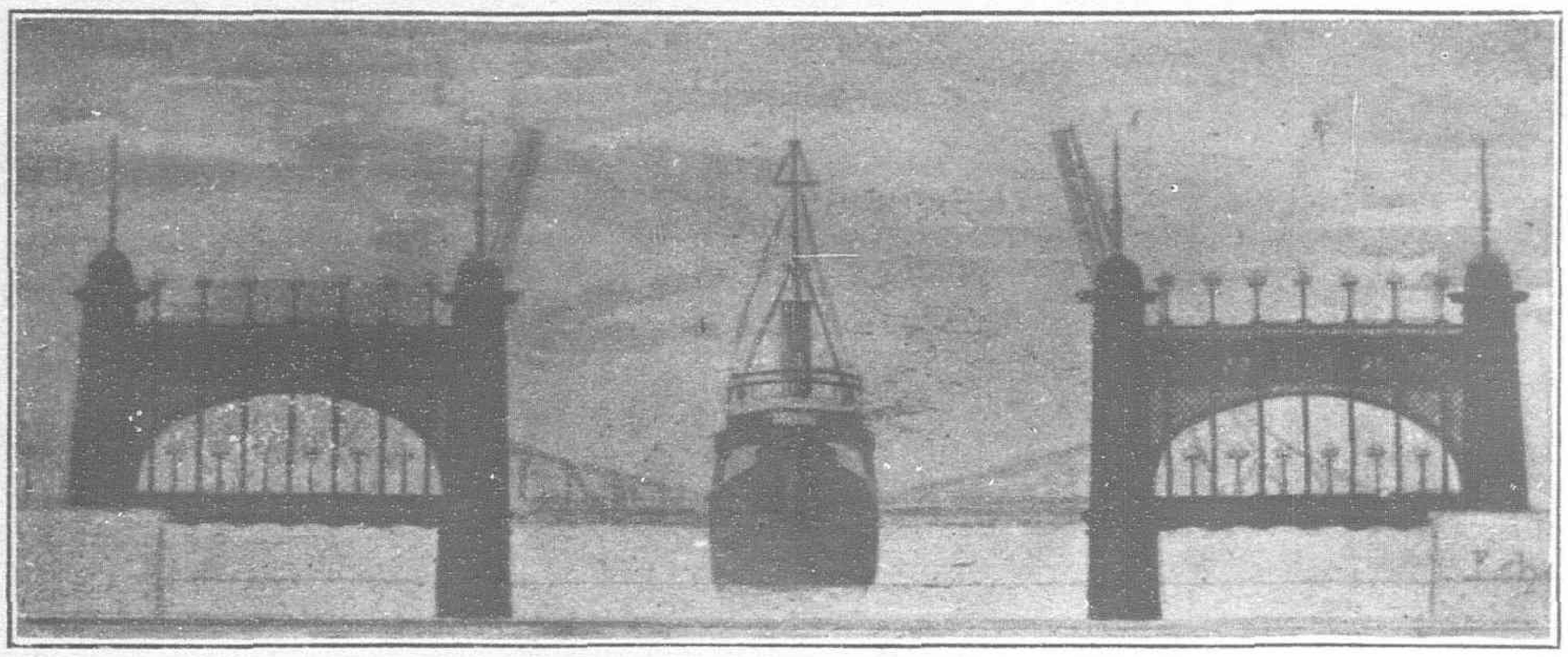
V. In the event of a shifting channel the mobile span can be correspondingly moved.

VI. The clearance under the bridge can be increased or decreased by a simple alteration to the towers.

VII. The vertical lift accommodates itself much better to a bridge running slant wise across the river because the mobile span can be bevelled.

VIII. The price per pound for the entire metal work of a bascule is decidedly greater than that for a vertical lift.

IX. The towers of the vertical lift structure offer a simple means of passage for electric, telegraph and telephone wires, as well as water pipes etc :



An Architectual Plan Submitted by the Societe Cockerill

X. For large bridges, long opening spans, and expensive substructure, the vertical lift costs less than the bascule.

I am of the opinion that the above claims have little application in our case.

Replying in the same order, I may say:

I. The Specifications prescribe a wood pavement covered by rope matting and this is also possible with the bascule type. A block pavement was also successfully adopted in bascule bridges.

II. In our latitude the wind is not very strong and frequent: we have only 3 or 4 days in a year with wind registering a velocity of 50 and 60 miles.

The Bascule Lifts can be manoeuvred with safety up to a 75 miles. Wind, which corresponds to "Storm."

Should, however, the wind be stronger, (hurricane 90 miles), the river traffic will cease and there will be no need to open the bridge.

Besides, we must remember that in a town, and with leaves 70-ft. long, we can safely assume that the wind effect will be reduced by 30 per cent.

III. It is true that the vertical lift does not need to be raised to the highest point when a low-masted craft is passing: but this, with unskilled operators, may constitute a cause for breakdowns. Besides, we may consider that for small craft, with the bascule type, it will be sufficient to open the leaves partially.

IV. V. VI. VII. do not apply to our River.

VIII. From the quotations, it can be seen that, for the proposed fairway, the bascule type can very well compete in price.

IX. The Hai Ho not being very deep, all pipes, wires, etc., can easily be passed under the bed.

X. Do not apply to our case.

I would, accordingly, recommend the refusal of the vertical lift bridge for the following reasons:

(*a*) An unequal settlement of the piers would render necessary the demolition and re-erection of the bridge.

(*b*) The vertical lift bridge requires to be fully open before a steamer can attempt to approach it, whereas, in cases of emergency, a steamer could approach a bascule bridge, on the centre line, when the leaves are not completely open.

(*c*) Foreign operators are necessary with the vertical lift bridge because the operating machine goes up with the bridge and will not be easily accessible in the open position of the bridge.

(*d*) Upkeep expenses with the vertical lift may run into higher figures than with the bascule bridge.

(*e*) Aesthetically the vertical lift bridge does not compare favorably with the bascule type as can be seen from the sketch accompanying this report.

(*f*) If we adopt a lift of 135-ft., the clearance may not be found sufficient in some instances: if we adopt a lift of 155-ft. in most cases the clearance will prove excessive.

We come now to decide between the Strass Bascule Type and the Scherzer Type.

All the projects of Strass Bascule Type show that, when the bridge is open, the structure of the leaves projects over 20-ft., off the pier face. To prevent a collision with the leaves structure, the designers have placed in the navigable channel fences formed of wood piles strongly braced together. These fences are highly objectionable to the free flow of the ice and of the current and, in any case, the design offers only a 100-ft., free channel when we require 140-ft., between piers (see note).

At the Governor's Yamen this may be fessible, but not at the French Concession, where a considerable number of steamers may pass.

The Scherzer Type, basculing backwards, leaves entirely clear the navigable channel of 140-ft., between the piers.

The Zimmermann Type indicates also piers in the navigable channel and the design is more complicated than the Scherzer Type, offering no serious advantage for the complication. The Orr. Watt & Co., plan a modification of the Strass, gives a free channel, but is more complicated than the Scherzer Type.

Of the other designs only the single leaf ones are acceptable but the large surface offered by them to the wind in a considerable drawback to the design. Aesthetically the design is not good on account of lack of symmetry.

I am, therefore, of the considered opinion that, in design, the Scherzer Type is the best for the following reasons:

A. The leaf and the counterweight make a solid indeformable mass moved backward and forward without complicated machinery and involving almost no upkeep.

B. The movement of the leaves is based on the most simple and ancient principle of the roller and requires a minimum of power for operation.

C. The great number of this types of bridge in existence and under construction all over the World shows that the design has given full satisfaction.

D. When open, the leaves clear entirely a navigable channel of 140-ft.

E. Some builders guarantee to manoeuvre the bridge with complete safety against a wind of 75 miles and all of them guarantee to open the bridge in less than one minute against a 50-miles wind, whilst they also find it possible to open this type of bridge by hand against a wind of 20 miles in a reasonably short time. (8 minutes).

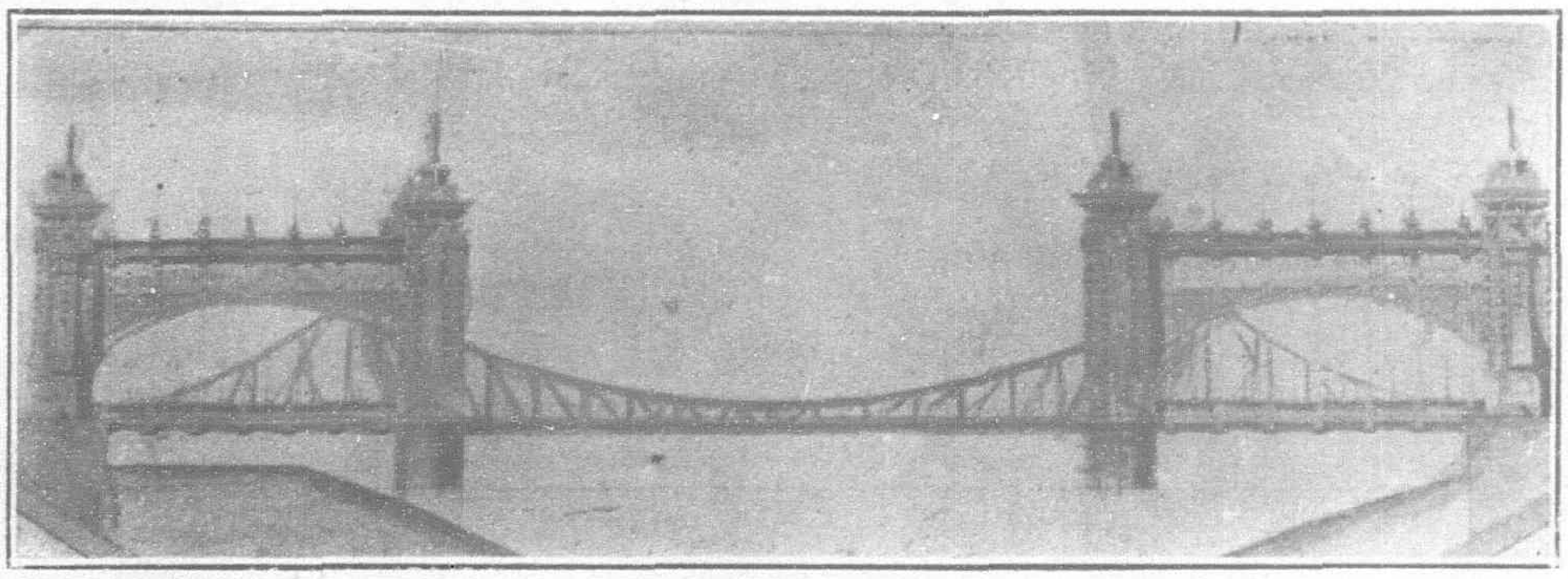
Tender Recommended

The five tenders of the Scherzer Type are all satisfactory and the design is that of the Scherzer Rolling Lift Co.

Aesthetically the best is the one recommended by the local Firm Etablissements Brossard Mopin.

I regret, however, that the ornamentation and the design of the piers adopted have increased the pressure on the foundation to Kgs. 3.83 per square centimetre, whereas the Specifications prescribe 2 Kgs. per square centimetre.

I have examined the argument of the designers by which they demonstrate that this pressure is admissible.



Another Architectual Proposal of the Societe Cockerill

Theoretically, admitting the correctness of Vierendeel's formula, I may admit that they are right: but, in view of the fact that the specific gravity and the angle of friction of the spoil at the site of the foundations were not ascertained, I am doubtful and much prefer to maintain the specified load of 2 Kgs per square centimetre.

On the other hand, I note that most of the builders accept this load and have designed their foundations in accordance with it. The Etablissements Dayde, whose competence in deep foundations and bridge building is second to none, have, not only accepted to assign a load under 2 Kgs per square centimetre, but have also proposed to build each couple of piers on a single caisson of 187 square metre surface of base.

Their admitted pressure is Kgs. 1.97 per square centimetre.

The project of the Etablissements Dayde is the cheapest Scherzer Type, put forward.

The effect of the general lines of the bridge is good.

The general plan of the bridge is that of the Scherzer Rolling Lift Co., and there is not remark whatever to make on it.

They also guarantee to manoeuvre safely the bridge against a wind of 75 miles per hour, and to open it in less than one minute against a wind of 50 miles per hour.

The foundations proposed by them are the best of all the Scherzer Type submitted.

The reputation of the Firm is the highest that one could desire. As the best type of bridge is unquestionably, the Scherzer type and, as the quotation of the Etablissements Dayde is the cheapest, my conclusion is obvious: I would recommend this tender as being the best one submitted.

Should the Board approve my recommendation, I would suggest the following conditions to be submitted to the Firm:

1. That the Firm be invited to give a final quotation in Tientsin Taels for the whole work, their quotation being fr: 2,918,400 and G$243,854 plus G$7,500 for auxiliary machinery.
   This with to-day's exchange works out at Tls. 577,000 or less.
2. That all the detailed plans of the Bridge be endorsed by the Scherzer Rolling Lift Co., before being sent in for approval.
3. That the Firm should send a civil engineer to superintend the whole work of erection and carry out the stipulated trials.
4. That the Firm should provide an expert operator to direct the manoeuvre of the bridge for a period of one year.
5. That the Firm should accept all responsibility with regard to bad workmanship or faulty material for a period of 10 years.

On further instructions from the Board, I am prepared to lay down the technical requirements to be included in the Contract with the Firm.

I am, Gentlemen,
Your obedient servant,
(Sd) T. Pincione
Engineer-in-Chief.

Note.—For 140-ft., fairway, the designers have placed the piers 178-ft. apart adding considerably to the unbalanced surface of the leaves when open against the wind.

The following taken from the Hai Ho Conservancy Commission report for 1924 is of interest in this connection:

The Board issued Specifications in 1923 inviting tenders for the New International Bridge.

Tenders were opened by the Board on May 1st, 1924 at 2 p.m. and handed over to the Engineer-in-Chief for his technical report. On May 15th, the technical report of the Engineer-in-Chief was handed to the Board.

The 17 tenders contained 31 designs as follows:—

Double leaf rolling lift Scherzer's Type ...	5 projects
Double leaf Strauss Bascule Type	7 ,,
Vertical lift Waddell's Type	11 ,,
Other Bascule Types	8 ,,
Total ...	31 projects

A careful study of the different designs showed that the type best fulfilling all local requirements is the Scherzer's Rolling Lift Type. Of the five projects of this type, the one recommended to the Board was that submitted jointly by Messrs. Etablissements Dayde: and Messrs. Schneider & Cie.

The following are the main reasons leading to this recommendation:—

1.—The tender above referred to was the cheapest of the Scherzer's Type and one of the cheapest of all submitted.
2.—The Builders accept full responsibility for the stability and good working of the Bridge for a period of 10 years after completion.
3.—The two couples of piers will be erected on two steel caissons transmitting to the foundation a pressure of nearly 2 Kgs. per square centimetre, in accordance with the Board's specifications.
4.—The Builders guarantee to operate the Bridge against a wind velocity of 75 miles per hour and to open the Bridge in 60 seconds against a 50 mile wind.
5.—The detailed plans of the Bridge structure will be passed by the Scherzer Rolling Lift Bridge Co.

New Vessel for Sarawak

His Royal Highness the Rajah of Sarawak, entrusted Messrs. James Pollock, Sons and Co., Ltd., of Faversham, with the building of a new yacht and passenger vessel, the *Maimunah*, which the firm launched towards the end of October. The vessel is built to the Rajah's own designs. The ceremony of christening the vessel was graciously undertaken by the Ranee Margaret of Sarawak.

Indian Railway Electrification

News is just to hand that the Indian Government has granted the necessary authority to the directors of the Great Indian Peninsula Railway for the carrying out of an extensive main-line electrification program, for which the whole of the orders for plant and machinery required are to be placed in England. It is estimated that the scheme will involve the sum of £5,000,000. It is now in the hands of a firm of consulting engineers, and involves the line from Bombay to Igatpuri and Poona, these places being respectively 85 and 119 miles from Bombay. The complete scheme covers about 300 track miles.

A New Vessel in the Indo-China Trade

Messrs. Denis Fréres, Bordeaux, the Indo-China representatives of Compagnie de Construction Mecanigue, Procédés Sulzer, Paris, have received the following news from their Haiphong office concerning this cargo boat belonging to the Chargeurs Réunis. It is propelled by two 4 st 68 engines (1,700 b.h.p. each, at 90 r.p.m.) built at Winterthur.

"The arrival of the cargo boat *Camranh* at Haiphong was excellent propaganda for Messrs. Sulzer. All the local representatives of business houses who could be interested were taken on board in a series of visits; everyone was surprised at the easy way in which the Diesel engines were managed and at their advantages. The ship's officers, especially the Chief Engineer, Mr. Lecoeur, were particularly enthusiastic over the engines."

Shanghai Municipal Electricity Department Does a Record Task

Following upon a recent breakdown of the Turbo Generator at the Dah Foong Ching Kee Cotton Mill, the Chapei Electricity & Waterworks Company, in conjunction with the Shanghai Municipal Electricity Department, effected a creditable piece of work. Supply was given and the spindles were able to run again within 6 days from the date negotiations were commenced.

The Dah Foong Ching Kee Cotton Mill is one of the largest mills in the Chapei area.

The foregoing brings forward one of the many advantages the Central Power Station possesses over the isolated plant.

The Suitung Coal Field

Hsienchen Hsien, Anhui

By Y. Tsenshan Wang.

THE Shuitung coal field represents a part of the scattered coal basins in southern Anhui. It lies in the southeastern part of the district of Hsienchen Hsien and embraces approximately two hundred eighty five Chinese square *li* or about ninety-five square kilometers. This field includes the relatively small areas of Anpin, Laushan and Hailushan coal deposits, the first mentioned one is north of Tsahualing and the second two are just to the west of Shuitung Ho near Chidingling and 25 *li* southwest of the town of Shuitung respectively, but the field considered in this report is bounded on the north by Tsahualing, on the south by the district boundary line between Hsienchen and Ningkwo districts, on the west by the Shuitung Ho and on the east by Tsatsen (see The Outline map of topography).

Accessibility

According to the plans of the Ministry of Communications the branch line of the Ninghsiang Railway, from Wuhu to Kashin, in Chekiang, crosses the north side of the city of Hsienchen and therefrom it branches south-southwestward to connect with the main line at Tsiki Hsien by way of Shuitung and Ningkwo (see sketch map of railways). The completion of this railway will be the most important means of transportation for the Shuitung coal field. At present the Tsingsui Ho and its tributary Shuitung Ho near by also affords a means of transportation except when they are shallow and unnavigable during a certain part of the year, from November to April inclusive. So far the coal from the Anpin mine is entirely shipped in small quantities by small junks by the water route. However, when the rivers are in high water as in Summer and in the early part of the Fall, in the territory accessible over the water route, the rivers will, if the shipping is properly managed, furnish a very economical means of transportation. At present no preparation for the construction of the above mentioned railway is known, but if a shorter line from Wuhu to Shuitung (less than 200 *li*) can be built, there will be a great hope for the development of the coal in the Shuitung field under consideration. A route over which a road could be cheaply constructed is along the valley of Tsinshui Ho by way of Wanchi, Hsienchen and Sunkiapu. Survey for the branch line of the Ninghsiang railway have been made along this valley, but construction has not been even considered. This line would pass through a territory containing numerous small basins or areas of coal deposit and some of them are no doubt well situated for mining. Wagon roads are easily constructed and maintained in good condition if those who are interested in the development of the coal field in the southern Anhui will provide the necessary funds.

At present the road to Shuitung from Wuhu by over land, is by way of Wanchi, Hsienchen and Sunkiapu. Wanchi is 70 *li* S.E. of Wuhu; Hsienchen is also 70 *li* S.E. of Wanchi while Sunkiapu is 30 *li* S.E. of Hsienchen and 30 *li* N. of Shuitung, the total distance is just 200 *li*. Chairs, wheelbarrows and animals are the means of transportation and in many cases human power is utilized for carrying baggages and goods of various kinds. As to the route by water, the distance is about the same, but only during the high water time the rivers are navigable from Wuhu to Shuitung and at other times the accessibility of the water route is only from Wuhu to Wanchi.

Field Work

The Shuitung coal field is probably not a separate basin geologically, but as a result of the tectonic change which undoubtedly took place before or about Tertiary time, it forms a separate part of the scattered coal-bearing basins in the southern Anhui and northwestern Chekiang; therefore, the boundaries as here defined are not natural limits, but simply mark the area examined by the writer and his assistant, Mr. H. F. Hsu, during the winter of 1923. Work for a detailed survey of the field was started, but on account of the change of policy on part of Mr. O. S. Lieu who financed the work, it was made necessary to cut short in order to meet with his desire for closing up the work at an early date. In the interest of his original plan, however, the general topography was sketched for the entire field by the use of planetable, telescopic alidade and stadia rod, locating only the streams, hill areas, valleys and locations of villages and roads but no time was available for interval contours. The locations of hill areas were made with regard to the summits of those hills of first importance whose boundaries are approximately located. Messrs. H. and H. F. Hsu undertook the work for sketching the general topography and studying the geology respectively in the northern half of the field, while the writer, in addition to the work on geology in the southern half of the field, devoted himself to the study of different geological questions in the whole field under consideration and left the work for topographic sketches to another surveyor, Mr. Pan Mon-nan of the Chang-An coal mine in Changshin, Chekiang.

Various formations as well as the structure and character of strata were examined and determined wherever the work was practicable. A considerable part of the field is covered by soils which conceals the formations and prevents an accurate determination of the presence of a certain definite beds. Neither the lines of coal outcrops could be traced in this field, nor was it possible to locate the approximate position of the coal beds from the coal bearing formations on the surface. The outlines for the foot of hill slopes were drawn at the approximate position of the hills studied.

Acknowledgments

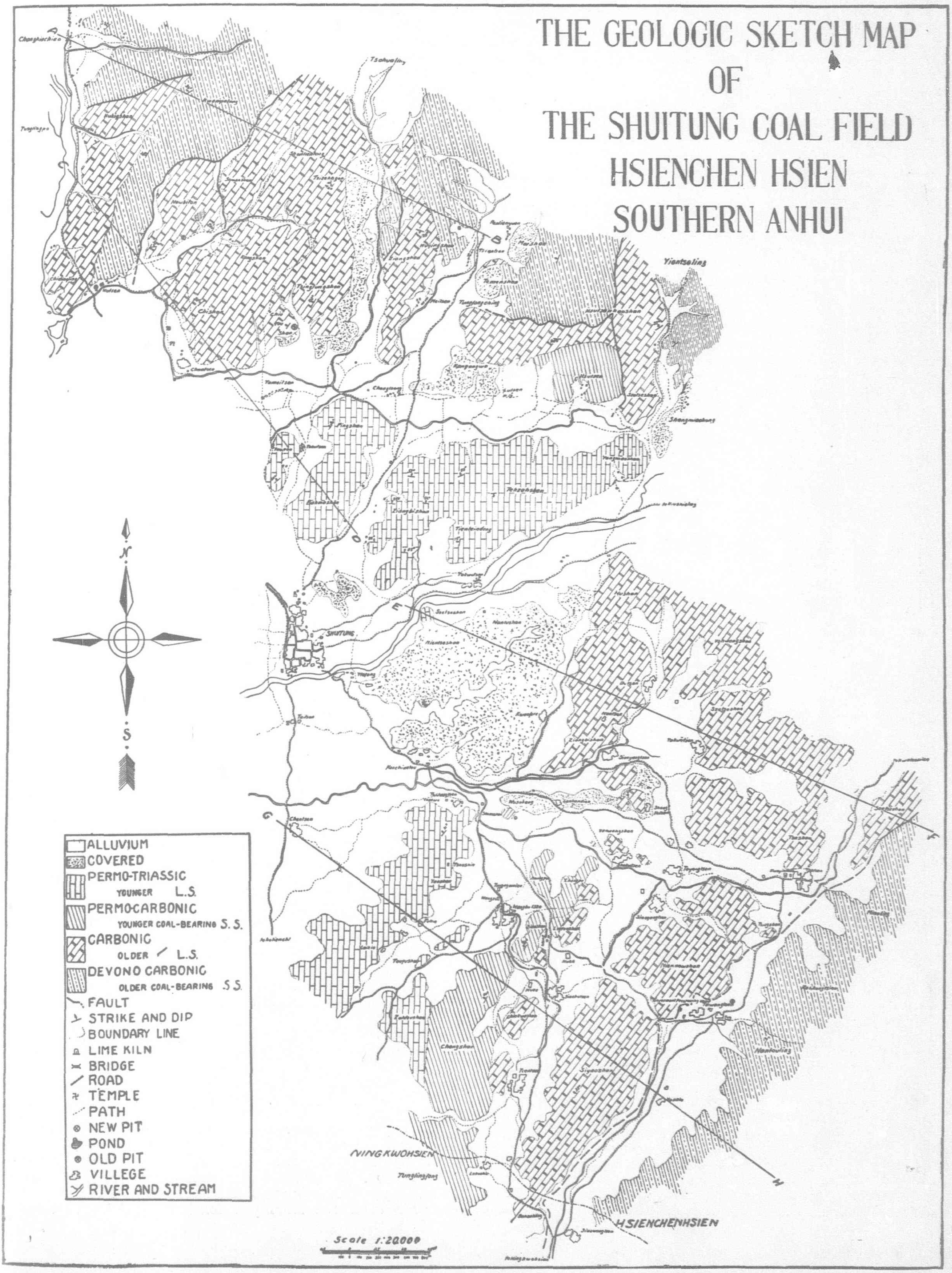
The writer was assisted in the study of geology by Mr. H. F. Hsu and in the surveying by Messrs. H. Hsu and M. N. Pan. To each of these gentlemen the writer wishes to express his appreciation for the assistance they have rendered to him in this connection.

Thanks are due to the members and especially the Chairman, Mr. Wu Watang of the Ching-Tai Commercial Association for their kindness in allowing the writer and his party to use the rooms in the Association building for their living quarters during the execution of the work.

Acknowledgment is due also to the Director Mr. Wang-Ta of the Supervision Bureau of Mines of Anhui at Wuhu for his hearty corporation in offering the writer facilities that were available at their prospecting camp at Tawangtsen. In connection with the before-mentioned prospecting camp, Mr. C. C. Tang, E.M. of Columbia University and now engineer in charge of the said camp, rendered him valuable service through personal interviews and by visiting part of the field together with the writer himself.

Topography

The maximum range of altitude in this region from the bank of Chiu-Chi Ho or Shuitung Ho to the top of K'aoshan north of Hsutsen, is about 350 meters. The area in the immediate vicinity of the town of Shuitung is quite level, but 7 *li* to the N.W., 4 *li* to the E., 6 *li* to the S.E. and 4 *li* to the S.W. of the town is more or less hilly with fairly deep gullies between hills, whose strike in general is uniformly NE-SW and whose slopes are in many cases rather gentle. The principal valley in which is situated the town of Shuitung, is usually covered with river deposits and the weathered products from the underlying beds or washings from the hills at higher elevations. The only river which is navigable and which is near by the field is the Shuitung Ho, but its navigability is practicable only during the rainy season, (November to April inclusive) and it is said that this river usually becomes very wide in such a season for the lower lands above the banks of either side are usually flooded.

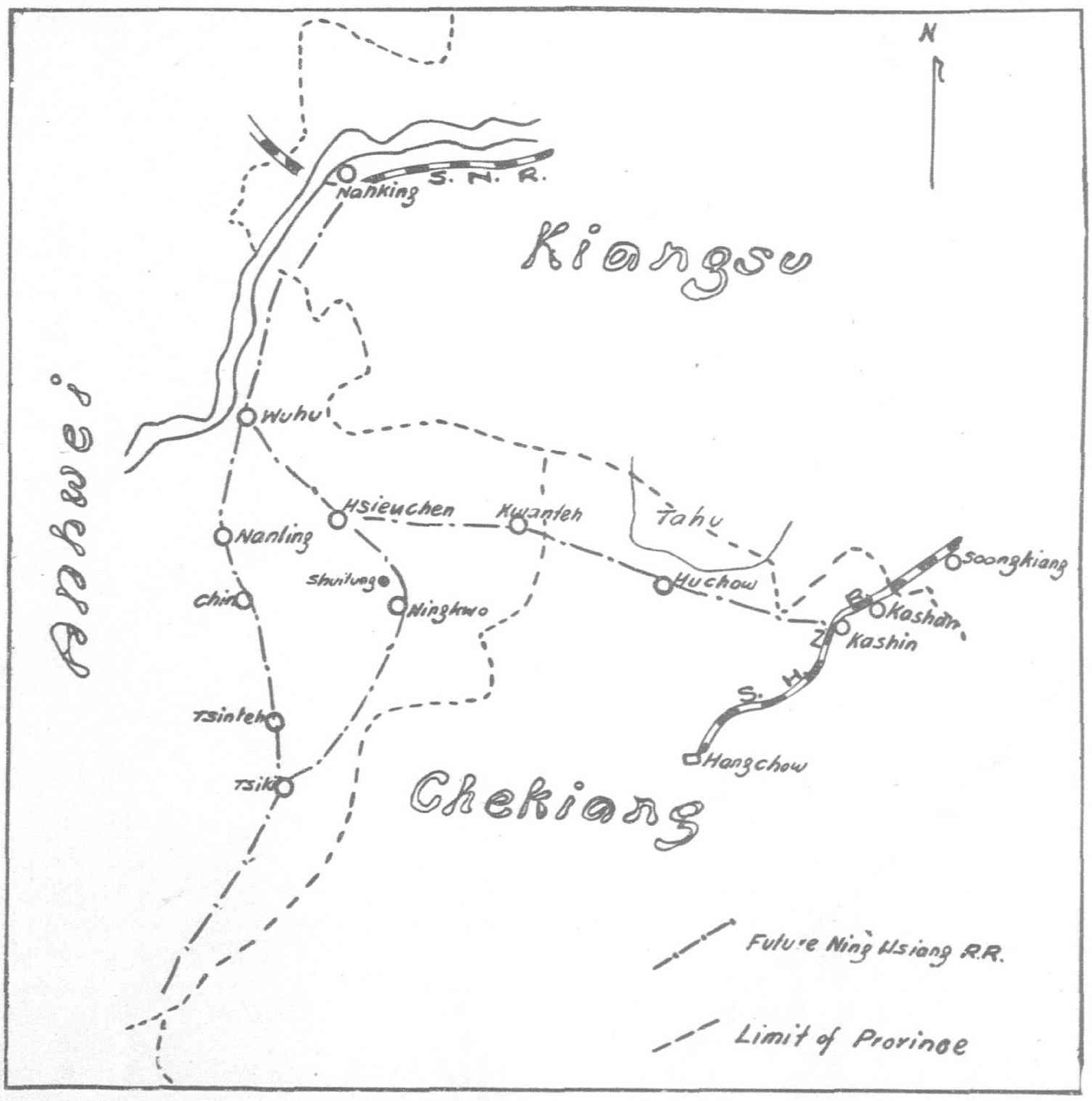


THE GEOLOGIC SKETCH MAP OF THE SHUITUNG COAL FIELD HSIENCHEN HSIEN SOUTHERN ANHUI

Although erosion by streams has made the wide valleys and numerous narrow inner gullies in this region, it is evident that they are chiefly due to structual movement. This feature is more conspicuous in the northern part and in the southeastern extremity of the field, such as around the Newbitan, K'aoshan-Szetseshan and Miaoling areas, where the topography is entirely different in character; hills of steep slopes predominate with here and there localities of greater relief and lofty summits. In places this hilly part of the field is thoroughly dissected by a system of somewhat deep, narrow coulees, the width of which far exceeds the depth. In many parts of the lower hill-slopes and in some cases even the steeper slopes and flatter hill-tops are cultivated throughout the entire field wherever a thin mantel of soil is available for the purpose.

Geology Stratigraphy

The coal-bearing rocks of the Shuitung field belong to the Permo-Carbonic and Devono-Carbonic formations, which are not the only formations exposed in the field. Economically they are the most important formations, but two others—a grayish thinly bedded limestone and a reddish or pinkish or darkish gray limestone—from the major part of the hilly areas. The two coal bearing formations are separated by the second mentioned and the younger one is overlaid by the first mentioned limestone respectively. Each formation of the region is described separately upward as follows :



Sketch Map of Railway

The Older Coal Bearing Formation

The older coal-bearing formation (of Devono-Carbonic age consists mainly of reddish yellow sandstone with the interbedded beds of shale and softmud, which at the immediate contact of a coal seam, either above or below, is indiscriminately whitish and sticky and which is taken by the native miners as a criterion for the presence of a coal seam being very close to it. Both shale and soft mud are comparatively very insignificant in their extent. In each case the gradation from one bed to the other is so distinct that the overlying bed is a sandstone, the one beneath it may be distinctly of a shale and vice versa.

This sandstone is predominately darkish yellow and reddish yellow, but as the beds vary in composition they also vary in color. Some of the exposures present a more or less bright and in others a dull aspect wherever the oxides of iron are sufficiently abundant.

The sand grains in this sandstone are sometimes so compact that some of our contemporaries considered it as a separate formation underlying the older coal-bearing sandstone and defined it as their quartzite. But the writer, for obvious reasons which are stated below, is compelled to differ with them and to consider the so-called quartzite as merely representing the quartzitic phase of the older coal bearing sandstone. Firstly, the more characteristic sandstone beds are graded into more quartzitic beds and the same gradation is repeated or inverted as the case may be, as seen in the hills east of Chidingling; secondly, if the quartzitic phase were to represent a separate formation as real quartzite, these could not have a perfect gradation but should have a disconformity between two formations. As it is, their gradation is perfect and disconformity is absolutely wanting; thirdly, the quartzitic phase of this sandstone is not only in this field, but it occurs also elsewhere. Mr. H. F. Hsu of our party came to the same conclusion, in the course of his field work in the Newtoushan region, that the so-called quartzite is not a separate formation, but merely represents the quartzitic phase of the older coal bearing formation (See the Chinese report on the Newtoushan coal field by H. F. Hsu).

That the quartzite in this field as well as in Kwanteh and Changhsin coal fields is part of the Devono-Carbonic coal bearing sandstone is beyond doubt. Furthermore, the older coal bearing sandstone in the Chidingling area occurs only in the middle and in the southern part of the area. The projecting part (See the Geologic Sketch Map) of Chidingling and the area to the north is formed by the older limestone of Carbonic age though the formations (see picture 1.) in the above mentioned places were once known to be quartzite.

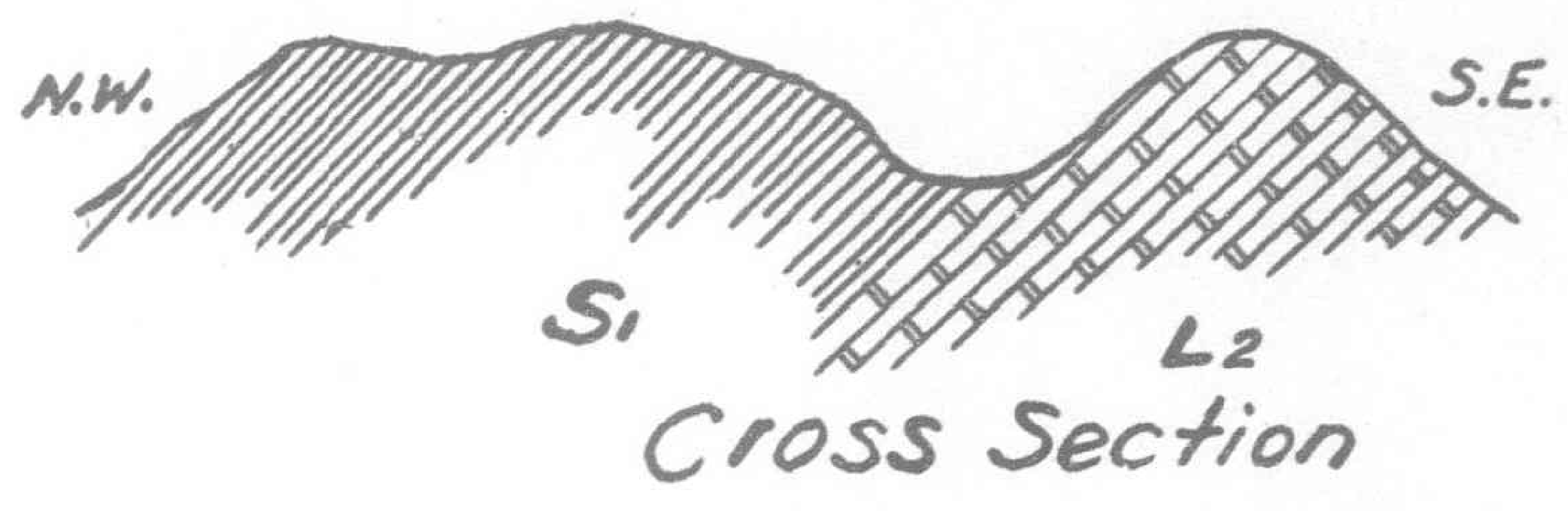
As shown by the preliminary geologic map, distinct surface exposures of coal seams are not known in this field. Only indications to the presence of coal and at some places a continuous line of coal bearing rock outcrops can be traced for some distance west of Hsutsen, south of Newbitan and a little way S.E. of Tawangtsen.

Furthermore, this formation is well exposed only over a small area in the east and in the extreme end of the northern part and in the southeastern end of the southern part of the field. It is impossible to correlate the different beds of this formation and is only possible to determine the stratigraphic position of the well exposed beds. Their positions are shown in the cross sections in this report, but it should not be assumed that the sections include all of the beds that may be found in this area. However, it is probably that the beds with the approximate thickness shown occur at the positions indicated.

The Devono-Carbonic sandstone overlies, throughout the entire field, the older limestone which are more extensively distributed in the field.

The Older Limestone Formation

The older limestone is either a darkish gray or reddish dark gray or pinkish dark gray in color. One of the characteristics of this formation is the inclusion of chert and flint in great abundance. At some places either chert or flint, especially the former, forms the predominant part of the entire rock. It is extremely hard where the chert or flint is predominant. Where the weathering



process is sufficiently advanced, the cherty limestone presents a perplexing and unusual structure which megascopically very much resembles a tuff or breccia (See the picture 2). In fact its peculiar character has deceived some geologists as well as mining engineers for extrusive rocks.

This characteristic feature of this formation is best shown near the top of Chikwoshan hill, Chidingling and in the Newbitan areas. The formation as a whole is well exposed at Chidingling, Newbitan and southward to Tameitsen, and north of Hsutsen in the northern part and occupies nearly the entire middle in the southern part of the field.

The influence of weathering on this formation varies with different portions of the rock, one side may be very badly weathered while the other side is almost intact. For instance the formation on the western slope of Zahtoushan near the Hungmiao temple, the hills to the west of Wanghutsen and the western slope of Chikwoshan, is thoroughly weathered to a pinkish loose material.

Stratigraphically, it overlies the older and underlies the younger coal bearing sandstone in this field as well as in the other parts of the southern Anhui. The formation is considered to be late Carbonic. Corals are plenty and the fossil, fusulina, is at many places sufficiently abundant as seen in the exposures in the hills to the northeast of the Hungmiao temple and other places where the formation is well exposed.

It is very striking to note that the thickness varies in different portions in not an inconsiderable degree. In the thin portion, the beds are only about 1 c.m. or less than 1-cm. thick, while in the thick portion, the beds may reach the thickness from $\frac{1}{4}$ to $\frac{1}{2}$ meter or more and the thick part is invariably underlying the thinner portion of the same formation. It is in the thick portion that the before-mentioned fossils are found at places in sufficient abundance. Where the chert or flint is not abundant or almost free, the rock is usually quarried by farmers for making lime.

This older limestone underlies the younger coal bearing formation which will be considered below.

The Younger Coal Bearing Formation

The younger coal bearing formation consists mainly of darkish yellow sandstone and is well exposed S.E. of Wanghutsen and farther south. It extends southward continuously into the neighbouring district of Ningkwo Hsien. Stratigraphically, it is underlaid and overlaid by the older and younger limestone respectively. It is perfectly conformable to the formation above and below.

In the northern part of this field, this younger coal bearing sandstone is exposed only around Hsutsen and is surrounded in part by the older limestone which forms the Szetseshan No. 1.

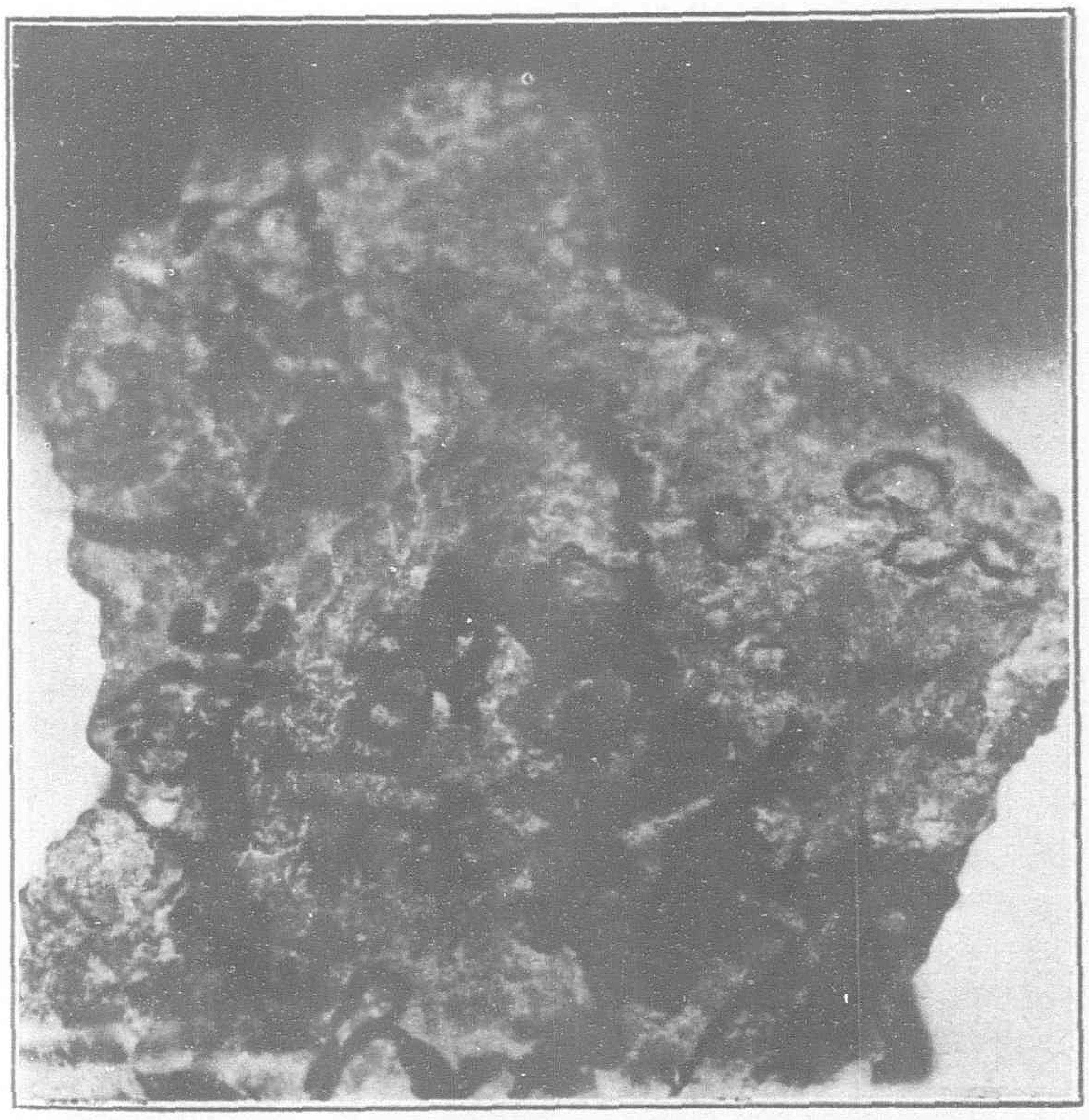
No distinction can be made between the older and the younger coal bearing sandstones with the exception that the younger one is comparatively coarser than the other.

The Younger Limestone Formation

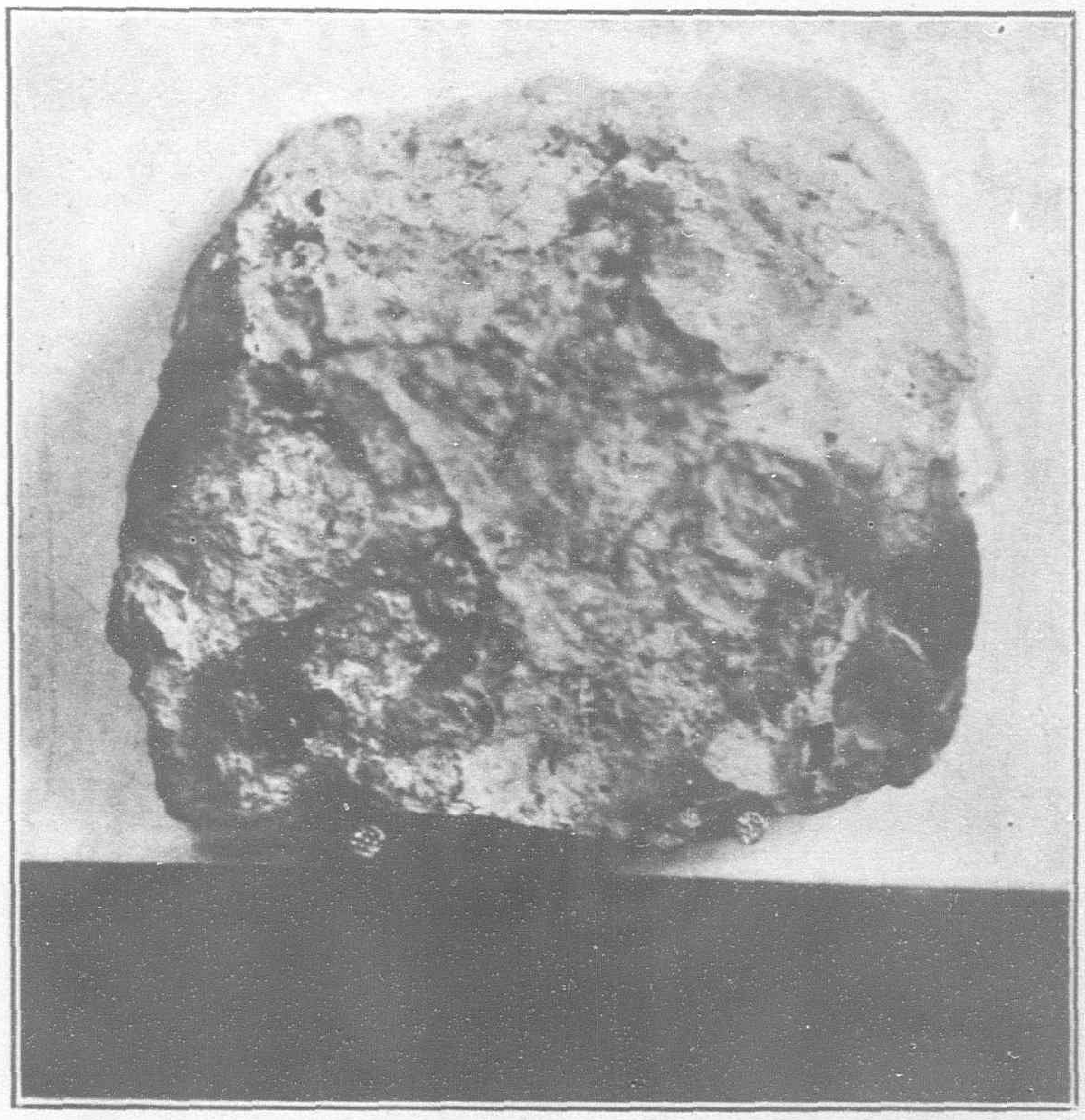
The younger limestone formation is usually thinly bedded. Stratigraphically, it overlies the younger coal bearing sandstone. It is well exposed about 4 *li* to the northeast and 5 *li* to the southeast of Shuitung. No time was available for fossil collection, but judging from their stratigraphic position, it is inferred that this thinly bedded limestone is either Permic or Permo-Triassic in age.

The formation as a whole is usually light gray in color and its thinness is the most characteristic feature of this formation and it has been used by geologists as well as mining engineers as a criterion for distinguishing it from the older limestone in this field and in other parts of southern Anhui. Sometimes it is so thin that the thickness is not more than $\frac{1}{8}$ of an inch. It has a very fine texture. It must not be understood that the beds in this formation are all thin. At places this thinly bedded formation may gradually grade into thicker beds and the thicker ones may in turn grade into thin beds.

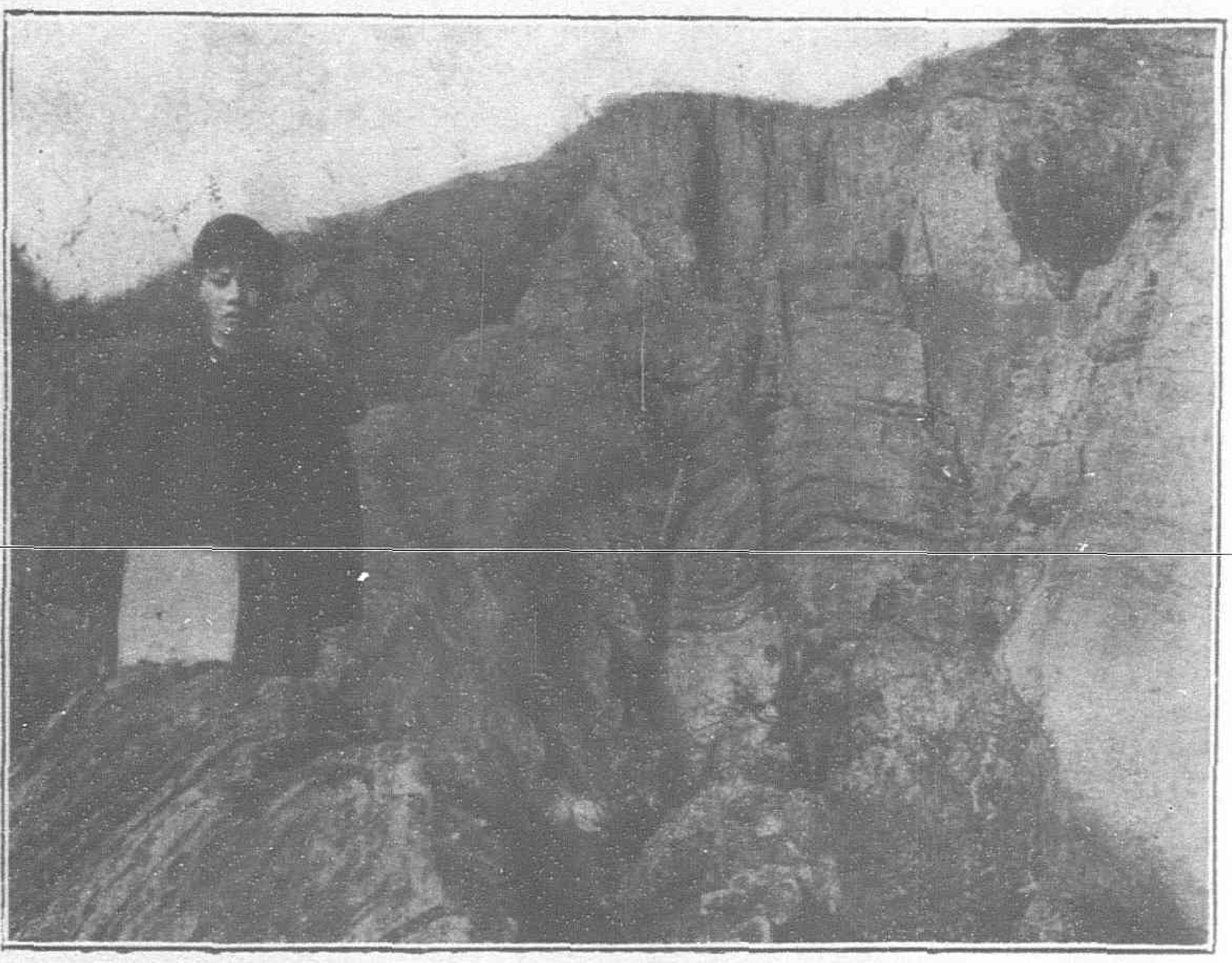
It differs from the older limestone in that the color of this limestone is general light gray and that it is free from chert and flint inclusions both of which are invariabily and abundantly present in the older limestone of Carbonic age. Much of it is used by farmers in the region for making lime and it is said that the thicker beds of this formation produce better quality of lime than the thin ones.



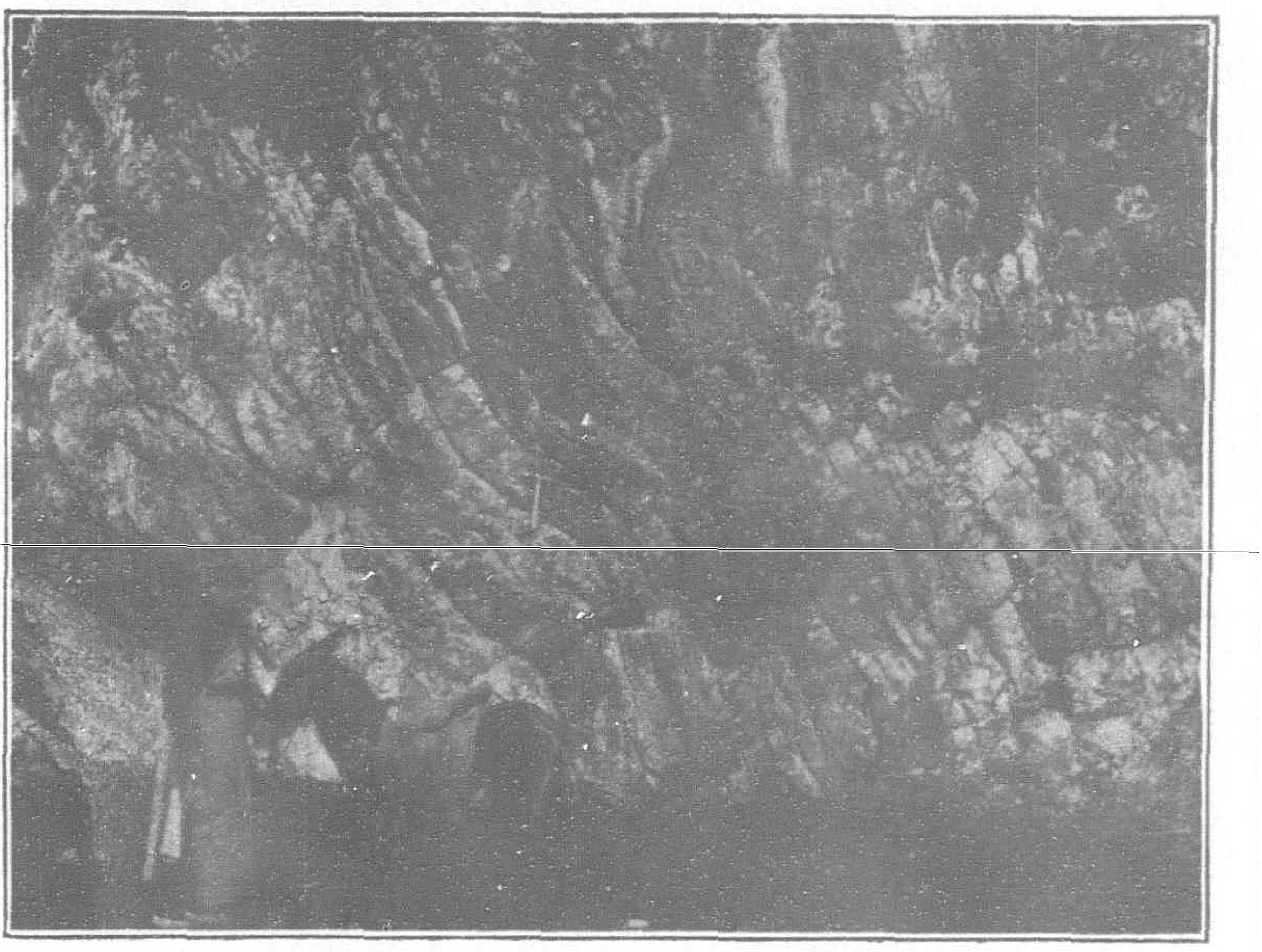
Picture 1.—Specimen taken from the older limestone formation showing the inclusions of chert and flint. They are marked in black circles, Chidingling. 10 li N.W. of Shuitung, S. Anhui



Picture 2.—Specimen taken from the older limestone formation showing the brecciated structure, near Newbitan, 7 li N.W. of Shuitung, S. Anhui



Picture 3.—The thinly bedded limestone of Lienshan near Takutsen showing the folded structure, looking n.e., 3 li S.E. of Shuitung, S. Anhui



Picture 4 to 7.—The pinkish limestone formation of Szetse-shan No. 2, showing the strongly contorted beds or structure. Taken at different positions of the fault-scarp

The Yihshan Conglomerate

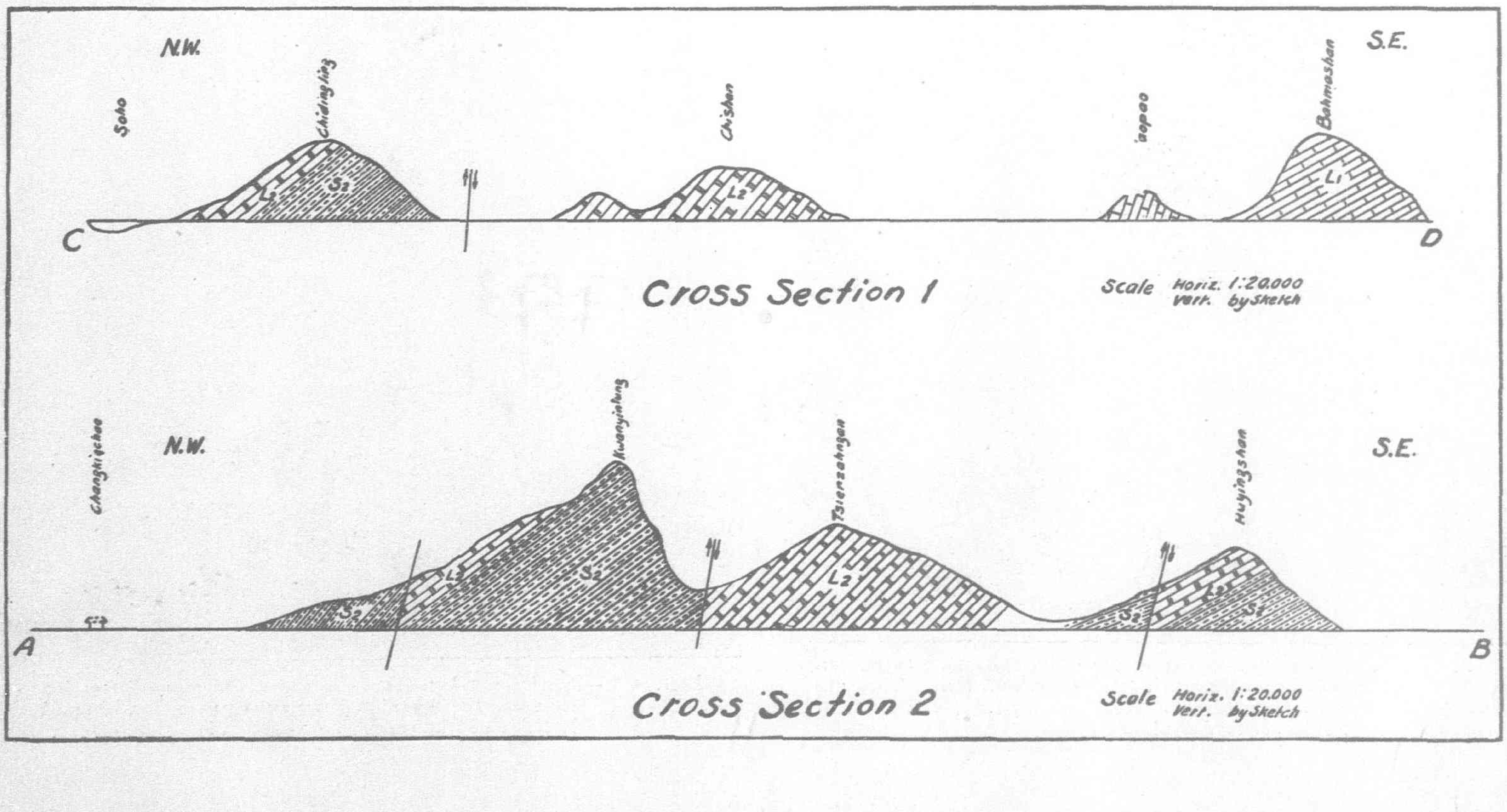
So far the formations described above are all within the field under consideration. The next series to be described is the Tertiary conglomerate which is indeed insignificant in this field as only a few remnants are seen at the foot of a hill a little way S.E. of Shuitung. It is wide spread in other parts in southern Anhui. The most widely spread exposure of this conglomerate is to be found in the group of Yihshan and Tsinglungshan hills, the former is 18 *li* S.E. of Hsienchen Hsien and the latter is 55 *li* W. of Shuitung. It is here designated by the local name as Yihshan conglomerate, which is probably equivalent to the Tatung formation of von Richthofen.

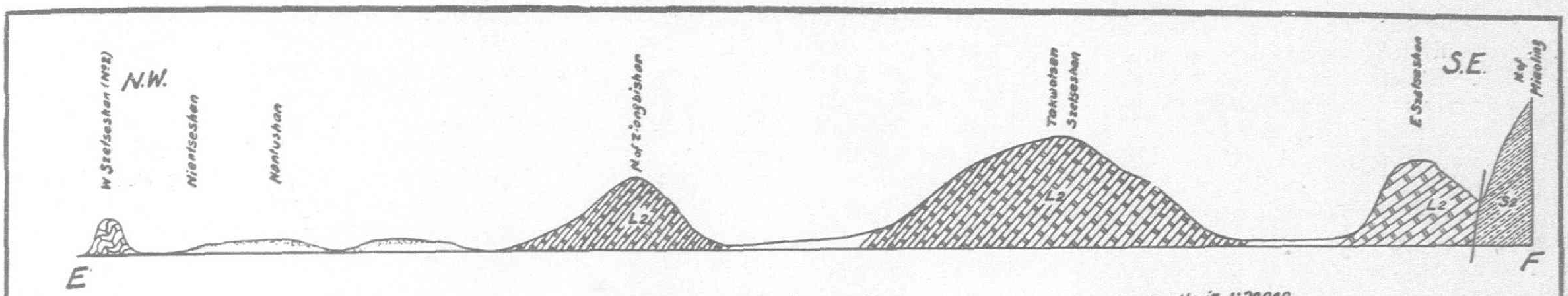
In the hills of the Yihshan group, this conglomerate forms summits and high terraces which in some cases continues in succession down to the foot of hills. Usually it has a very small angle of dip. In the summit of Yihshan the angle of dip is only from 9 to 12 degrees. In other parts the inclination of the angle seems to have followed the underlying beds. The pebbles, as far as the Yihshan conglomerate is concerned, are more or less angular and consist entirely of limestone chiefly the reddish or pinkish in colour. It is equally true in other parts of southern Anhui, though the limestone pebbles may be substituted by quartzitic sandstone ones.

It would be very interesting from the geologic point of view to discuss the origin and the condition under which this conglomerate was deposited, but space did not permit any detailed discussion on the purely scientific side. It should be sufficient for the present purpose to regard it to be a Tertiary conglomerate.

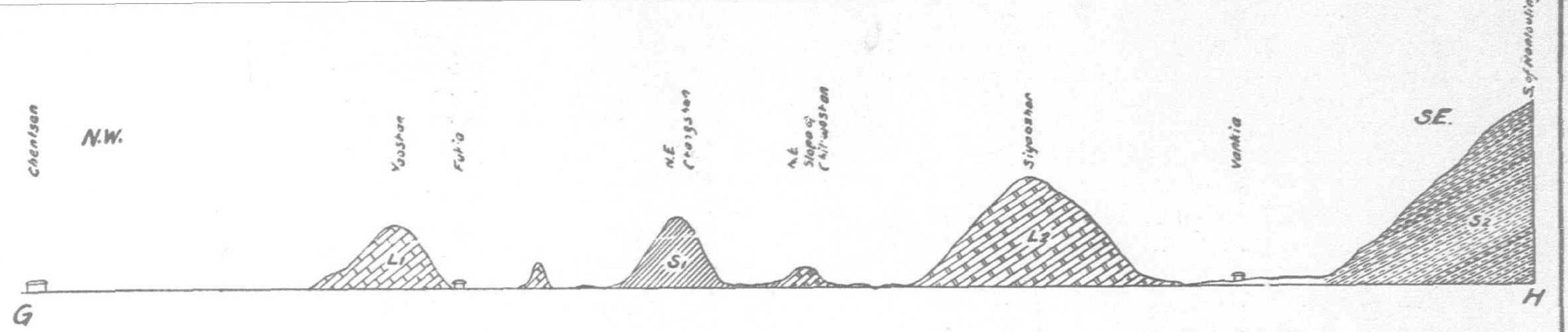
Structure

The beds of the above-mentioned formations of this field were deposited antecedent to the great epoch of mountain making of the Quinlun system which, in passing into Anhui, gradually turns to strike N.E.-S.W. It is probably not until the late Tertiary time, the structural movement folded the formations under discussion into broad synclines and in places the beds of all these formations dip N.40-50 W. from 30-40 degrees, but this dip decreases or increases or changes its direction where near the periphery of the centre of structural disturbance. For instance, the limestone beds of Lienshan east of the villege of Takutsen dip S. 75 W. with





Cross Section 3



Cross Section 4

much steeper angle of 60 degrees while strongly contorted structure is well exhibited in the same formation near the last named village as well as in the pinkish limestone of Szetseshan no. 2 N.E. of the said village or 3 *li* S.E. of Shuitung pictures 3 to 7 inclusive).

True faults are not uncommon. The high range of the hills to the south end of the field was formed by a dip fault which caused the older sandstone series to rise abruptly with a displacement of, in this particular case, not less than 150 meters, if not more, on the down throw side of the overlying rock the older limestone formation in this report to form a broad syncline valley, in which is stituated the mining villege of Tawangtsen. The up-threw side or the high ridge forms quite a long range in the direction of N.E-S.W. and has been used for the boundary line between Ningkwo to the south and Hsienchen to the north and part of the ridge to the S.E. of Tawangtsen is known as Nantouling.

The Chidingling certainly represents a fault block between two faults which almost run parallel and which reprobably close to each other or gradually die out to the N.E. of the area. The fault on the south side of the block is adjoined by minor faults, one of which can be traced southward into the area known as Newbitan.

According to Mr. H. F. Hsu, one of the members of my party, other lines of dislocation can also easily be traced west of Tientsinton and northeast of Hsutsen, the faults at the last-mentioned area are right angle to each other, one caused the older limestone to rise forming Szetseshan No. 1, while the other threw up the older sandstone to form the K'aoshan.

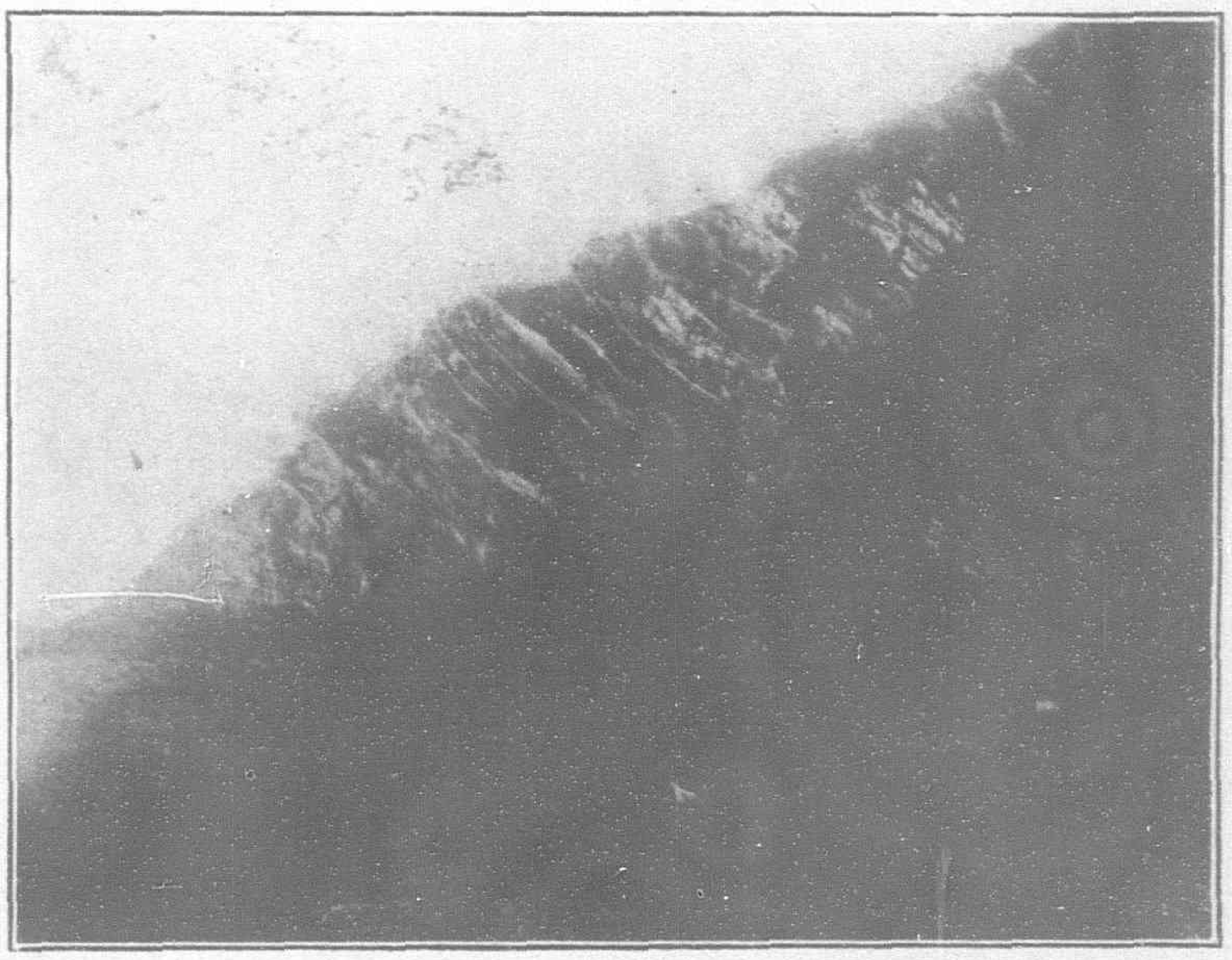
Cross beddings and ripple marks are uncommon in any of these sedimentary beds. But near the summit of the Nantouling pass, the quartzitic sandstone beds dip N. 45 W. at 32 degrees with ripple marks well exhibited on the upward side of the dipping plane.

Between the deposition of the younger limestone and that of the conglomerate, the hiatus represented is probably continental and very great, but this report is intended only for practical purposes and any discussion for such geological recognition of the break will necessarily be avoided.

Coal

OCCURRENCE.—It is inferred from the studies of occurrence of the coal in the same formations in other parts of southern Anhui that the coal occurs in both older and younger sandstone series. In places the very noticeable black color of the soil derived from the shale of coal bearing rocks, attracted for years in the past the attention of prospectors, who usually explored it whenever their native methods of mining could be utilized or until they were upagainst with the increasing quantity of water in depth. To date only two mines have survived in the district of Hsienchen Hsien, the Anpin and Chinbai mines, and both of them are outside the field under consideration.

Picture 5.—Szetseshan No. 2



Picture 6.—Szetseshan No. 2

In his celebrated work, "China," Richthofen made a mention of three limited coal fields in the southeastern part of Anhui. The field which we consider now is a part of one of his three coal fields. The writer visited all these three fields in 1923 on behalf of Mr. O. S. Lieu, resident representative of the Kailan Mine Company at Shanghai, and found that the coal seam worked in every locality in all these fields, was very irregular in size, extent and thickness.

In the hope of enabling his reader or readers to comprehend the exact nature of the occurrence of coal in his field, the writer will record here a few facts pertaining the underground condition and nature of the coal beds in the mines in other parts of Southern Anhui.

IN THE CHINBAI MINE.—A coal seam was reached by a slope pit at a depth of 120-ft. (Chinese) below the surface and the seam was 4 to 5-ft. thick. It strikes N.E-S.W. and dips N.W. It is quite irregular in its width and the coal usually interstratified with shale. Its thickness also varies greatly from 1 to 5-ft. within distance of 480-ft. (Chinese). The rocks as seen in this pit slope is, beginning with the top most one, as follows:

Soil and loose stones in angular form... ...	20-feet
Black thin shale	10-40 ,,
Dark gray limestone	10-100 ,,
Soft black med	1-in.-5 ,,
Coal seam	1-in.-5 ,,
Whitish gray sandstone	40 ,,

IN THE WOOSHIN MINE.—A coal seam was reached at a depth of 130-ft. (Chinese) below the surface. It is striking to note that at a depth of 147-ft. (Chinese) on the pit slope, a further slope was cut into the seam for a distance of 17-ft. (Chinese) without reaching the bottom of the coal in question, so the thickness of the seam in this particular part was not less than 20-ft. though it was seen to be thining out to the S.W. and N.E. At a depth of 15-ft. further down the slope, another seam was met, but it was only 1-ft. thick. The rocks as seen in the pit is, beginning from the topmost one, as follows:

Yellow soil and anular stones	30-feet
Black thinly bedded l. s.	30 ,,
Thinly stratified l. s.	30 ,,
A thick layer of blackish white soft mud... ...	—
Coal seam	1-4 ,,

In the seam found layers of shale in form of small patches.

PHYSICAL CHARACTER.—The coals of southern Anhui, in the writer's opinion, seem to be on the boundary line between the sub-bituminous and bituminous coal as they possess certain qualities which are generally considered peculiar to each of these classes. As a rule the coals of the younger series usually exhibit vitreous luster. They are often soft and do not bear exposure well, but tend to slough away to powdered form, whereas the coals from the older series appear to be of little more compact and comparatively brittle though in some instances they are also soft. They are all deep black. The distinction between coals of the two series in this part of Anhui is not absolute, as the vitreous coal may also occur in the older series and the brittle character is not uncommon in the younger series of the coal bearing formation. The bulk of the coal is, therefore, somewhat higher in grade than sub-bituminous and in the meantime it possessess much of the physical characteristics of a bituminous coal.

The coal of both series are commonly interstratified with shale and clay in quantities and this is especially true of the coal in the younger series. Their commercial value is further impaired by the fact that the coal, particularly the younger series, is of poor stocking quality, disintegrating rapidly on exposure to the air for any reasonable length of time.

Picture 7.—Szetseshan No. 2. All these Szetseshan pictures are taken from different parts of the faultscarp showing the strongly contorted structure in various degrees

CHEMICAL COMPOSITION.—As all the coal mines in the field under consideration were closed and as the entry to those mines have been either caved or filled with water, there was no chance to obtain a sample from their inner workings. Although new pits have been recently located by Mr. C. C. Tang, the engineer in charge for the Supervision Bureau of Mines for the whole province of Anhui, at Tawangtsen, yet the prospecting work had not gone far enough to warrant any underground examination at the time of the writer's visit. The only mine which is supposed to have been continuously worked, is the Anpin mine, but it is not accessible to the writer and is beyond the limit of the writer's field. No samples for analysis therefore were taken in this field. The samples, however, collected in the Spring of 1923, from the coal-yard of Anpin and the workings of Chinbai and Woos' in mines will be used here for the purpose of showing the chemical analysis of the coal mined in southern Anhui, inasmuch as the coals in that part of the province are all from the same formations. With the exception of the samples from Anpin, the samples from Chinbai and Wooshin were all from their fresh exposures when they were collected. The sample from Anpin gave on analysis 11,160 British thermal units (calculated) in the air dried material, while the samples from Chinbai and Wooshin gave 12,100 and on average 11,645 B. t. u. respectively. The similarity of the coals of the two series given above, based on the physical characteristics, seems to be corroborated by chemical evidence. The deep black coal of brittle nature is bituminous, whereas the textureless coal of vitreous luster may be considered as sub-bituminous.

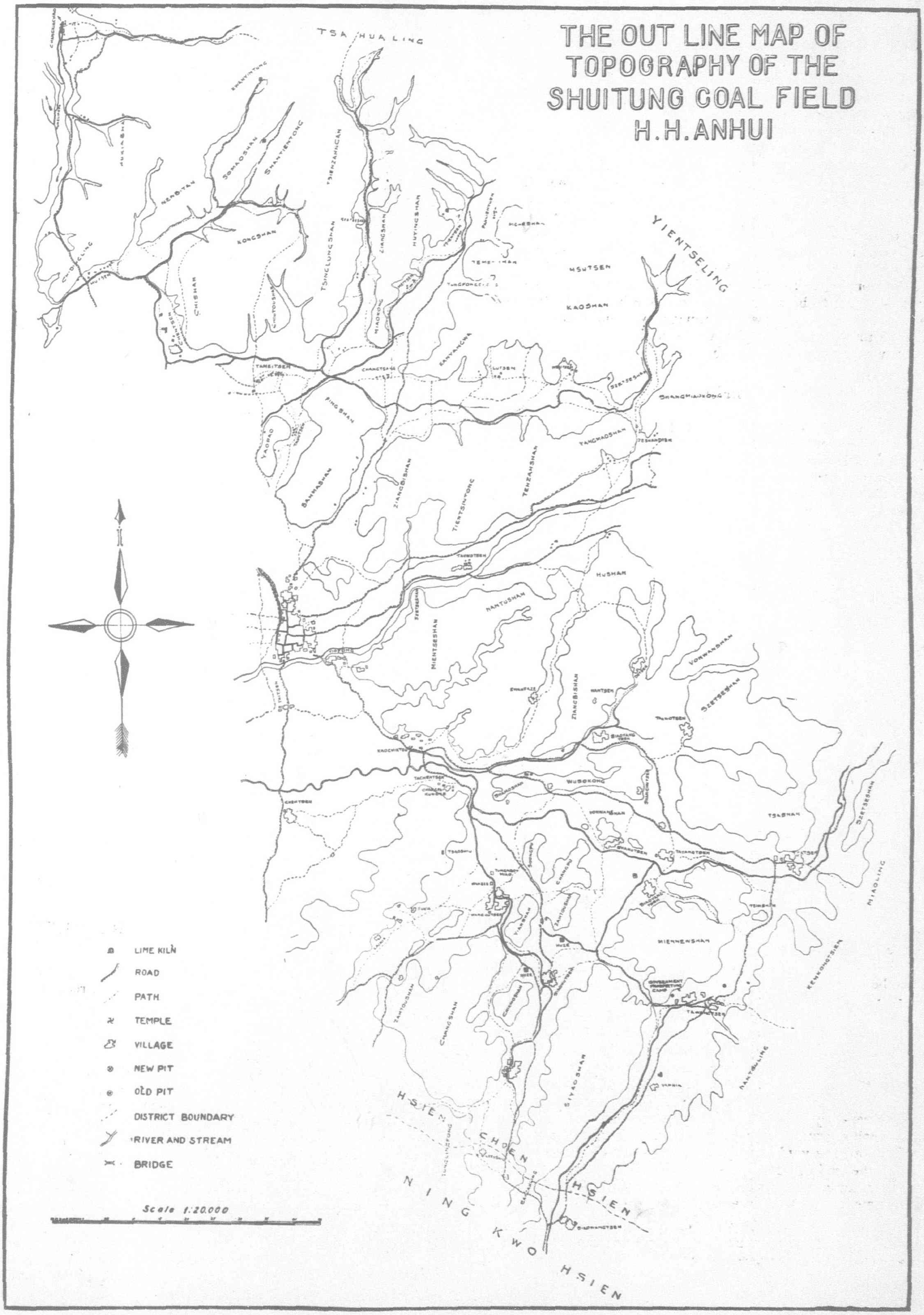
The Chemical Analysis of the Samples from the above-mentioned three mines.

Mine	Moisture. per cent.	Volatile matter. per cent.	Fixed carbon. percent.	Ash per cent.	Sulphur. per cent.	B.t.u
Anpin ...	.4	23.4	47.80	28.40	6.70	11,150
,,	—	21.28	48.54	30.18	4.11	—
,,	2.00	18.33	48.35	30.21	1.11	—
Chinbai ...	.50	18.50	58.10	22.90	4.50	12,100
Wooshin ...	.90	19.30	51.40	28.40	3.60	11,190

The samples from Anpin and Chinbai each forms a hard non-porous coke while that from Wooshin forms no coke, according to the Chemists of the Shanghai Chemical laboratory.

Quantity of Coal

Under the present mining conditions in this field it is held, in the writer's opinion, that no bed of coal of this grade thinner than one-third of a meter is workable with profit. As has been pointed out in the preceding pages that no examination of actual coal seam could be made throughout this field at the time of the writer's visit, it is no easy task to predict the future or the quantity of coal of such a field. Nevertheless, it is the purpose of this paper to interpret to the best of our ability the bearing of geological facts and the data obtained from the same formations in the mines in other parts of southern Anhui upon the quantity of coal. For such a forecast of the quantity of coal, however, moderate probability is all that can be claimed. The assumption in which the quantity of coal in this field is based may be briefly stated as follows: If the workable bed is on average .684-m. (2-feet) thick in one series and 1.368-m. (4-feet) in both series of the coal bearing formations, there is a total area of 120 square *li* (39.813120 square kilometers) within which the land is assumed to be underlain partly by one and partly by both series of workable coal beds of similar thickness as given above.


THE OUT LINE MAP OF
TOPOGRAPHY OF THE
SHUITUNG COAL FIELD
H.H.ANHUI
TSA HUA LING
YIENTSELING
HSUTSEN
KAOSHAN
KONGSHAN
CHISHAN
PINGSHAN
BANMASHAN
ZIANGBISHAN
TIENTSINYONG
TENZANSHAN
YANGMAOSHAN
HUSHAN
NANTUSHAN
MIENTSESHAN
ZIANGBISHAN
VORWANSHAN
SZETSESHAN
WUSOKONG
TSASHAN
MIENNENSHAN
SZETSESHAN
MIAOLING
KEWKONGTSEN
NANTOLING
SIYAOSHAN
CHANGSHAN
GOVERNMENT PROSPECTING CAMP
HSIEN
CHOEN
HSIEN
NING KWO HSIEN
LIME KILN
ROAD
PATH
TEMPLE
VILLAGE
NEW PIT
OLD PIT
DISTRICT BOUNDARY
RIVER AND STREAM
BRIDGE
Scale 1:20.000

A bed of coal 1-ft. (or .342-m.) thick contains approximately 162,000 tons to the square *li* or .331,776 square kilometers. Of this, 121,500 tons (less 25 per cent.), may be mined under favorable conditions and under very poor conditions the minimum recovery will be at least 60,750 tons (half of 75 per cent. of coal per square *li*). The following estimate is made on a very conservative assumption that only 50 per cent. out of 162,000 tons to the square *li* or .331,776 square kilometers may be recovered.

The total tonnage on the 2-ft. basis is 9,720,000 tons for 60 workable square *li*. The total tonnage on the 4-ft. basis is 19,440,000 tons for the other 60 workable square *li*. Then the two totals amount to 29,160,000 tons for the entire area under consideration assuming only about 60 square *li* of the land is underlain by one and the other 60 square *li* by two workable coal beds respectively. If the future mining operation will produce 2,000 tons a day, it will take about 40 years to take out 50 per cent. of the coal in this field according to the above basis of calculation. If the thickness should prove to be thicker and workable beds to be than what are assumed above, a greater tonnage will be available. But it must be understood that the above estimation cannot be considered any more than the hypothetic assumption.

Conclusion

In view of the present condition of transportation, no mining operation on a large scale can be profitably installed. In addition to the difficulties in transportation, no company can work profitably unless it can acquire all the claims not only in this particular field but also the mines in the other fields in southern Anhui. For the simple reason that laterally the coal beds cover quite a wide area, but vertically there are very likely not more than two to three workable beds in two series put together. Furthermore, in the part of the field only the second or the older coal bearing formation is present. The information gathered by the writer all seems to indicate that there is probably only one coal bed in each of the two coal series may be worked with profit, though such a condition can not be held to any certitude until more prospects are opened in this field.

Highway Construction and Maintenance in the Philippine Islands

(Continued from page 20.)

Aggregate No. 3 shall be spread on the top course of Types "A" and "B" roads and thoroughly swept in and rolled dry. The screenings (aggregate No. 3) shall not be dumped on the surface of the stone, but shall be cast thinly with a spreading motion of the shovel from piles at the roadside. The rolling shall continue while the screenings are being spread, so that the jarring effect of the roller will aid them in settling to the bottom. The screenings shall not be allowed to take or bridge on the surface of the stone in such a manner as to prevent the perfect filling of all voids and the direct bearing of the roller on the surface of the stone. The spreading and rolling shall continue until no more screenings will go in dry. No excess of screenings shall be used before applying water. Immediately after the voids of the macadam have been filled with screenings the macadam shall be sprinkled until saturated, the sprinkler being followed by the roller. More screenings shall be added if necessary. The sprinkling, sweeping and rolling shall continue until a grout has been formed of the screenings and water, that will fill all the voids and will form a wave of group before the wheels of the roller. The macadam shall be kept wet at least twenty-four hours before the final rolling, and it shall be puddled as many times as may be necessary to secure satisfactory results.

Ashes and cinders from fire boxes shall not be dumped on the metal. Any litter that may be dropped on the metal must be removed before the roller passes over it.

15.—Gravel Roads.—Upon the subgrade, prepared as herein specified, there shall be constructed a gravel road laid in courses as provided for macadam roads in the specifications. The same classification as to size of aggregates used for broken stone in section No. 11 applies to gravel with the exception that aggregate No. 3 in the case of gravel roads shall be material that passes thru a one (1) centimeter opening (in other words, coarse sand).

If in the opinion of the Director aggregate No. 3 does not contain a sufficient percentage of binder, such a percentage of clay or other binding material as the Director may consider necessary shall be added. In no case shall a clay binder be added without specific prior authority.

The specifications embodied in sections 13 and 14 relative to the preparing of the subgrade to receive the metalling, and the hauling, placing and rolling of same, apply in the construction of gravel roads.

All gravel shall be composed of hard, durable, clean particles of stone, well graded as to size; shall not contain any particles of sandstone, shale, slate, coal or other materials which may readily disintegrate. It shall be free from vegetable or other deleterious matter. The Contractor shall furnish the Director samples of the gravel he intends to use, so that same may be tested for cementation, abrasion, hardness and toughness, if deemed necessary. *No gravel shall be used which fails to satisfy the Bureau standards in these particulars*, as specified in the following section.

16.—Quality of Gravel and Broken Stone Used in Metalling.—All broken stone or gravel used on roads must have physical properties as follows:

Abrasion	..	..	10% or less
Hardness ..	..	..	14% or over
Toughness	..	..	10% or over
Cementation	..	..	75% or over.

The use of broken stone or gravel of an inferior quality to the above *will not be permitted without the written approval of the Director*, which will only be given in cases where it is impracticable to obtain material conforming to the above specifications. Contractors will submit samples of the stone or gravel they intend to use to the Director for test, *and no stone or gravel will be used until the Contractors have been notified by the Director, in writing, that the use of same is permissible.*

17.—Plans for Standard Types of Roads and Standard Depositories.—The attached B.P.W. Plans No. 1 sheets 1 and 2, No. 2 sheets 1 and 2, and No. 3 sheet 1, will be considered as part of these specifications and illustrative of the same, unless otherwise specified.

China's Need for Machinery

CHINA'S desire to make industrial progress is evidenced by her purchases of machinery which has, however, received a check, says *The British Trade Review*. In the earlier part of 1924 the demand for the equipment of new factories and commitments against capital was very dull owing to financial stringency. The great number of inquiries placed before machinery importers were evidence that the desire to purchase and the need for machinery were as strong as ever; lack of money, however, on the part of intending buyers prevented further developments. Towards the middle of the year there was a distinct improvement, old estimates were revived, and serious business was started on a healthy basis; orders were placed and negotiations advanced to the point of fulfilling the hopes which had been entertained for 1924. Unfortunately, the outbreak of civil war in September caused a complete collapse of the trade; contracts about to be placed were temporarily abandoned, other negotiations fell through, and inquiries for new plant ceased altogether. Furthermore, money due on goods supplied could not be collected, and a strong desire to cancel orders became manifest, so that the end of the year saw the machinery market in China almost paralysed.

Gambir or Catechu Production in the Dutch East Indies

THE use of tanning materials is on the increase in the world, and since the temperate zones are no longer able to meet the demand for these products it has become necessary to cover the present requirements in territories overseas. This explains why materials which were only one or two decades ago practically unsaleable in Western countries are now eagerly sought after.

Yellow catechu or "gambir" (by which name it is generally known in the Malay archipelago) is an example of this, for at the beginning of the nineties this product was almost unknown on the world market, whereas to-day it is recognized both in the United States and in Europe as being one of the most valuable tanning agents in existence. In fact, the material possesses characteristics which no other tans possess, so that it is used and can be used with excellent results in the production of almost every kind of leather.

The most important constituents of gambir tannin—which is a solid substance obtained by evaporating the extract from the leaves of the *Uncaria gambir*, a shrub with climbing branches —are catechine and catechu-tannic acid, while a small quantity of a dyestuff, quercetine, occurs. The percentage and the properties of these constituents vary according to the method of preparation.

The product is and always has been used by the native population of the Dutch East Indies as a luxury, i.e. for "sirih"-chewing, a habit which is as general throughout the East as tobacco-smoking is throughout the West. This use is mainly due to the presence of catechine. It is further employed in the colony in leather tanning and, in smaller quantities, for tanning ropes, fishing nets and sail-cloth.

The Sorting of Cube Gambir

The cultivation of the gambir shrub is confined to Sumatra, the Malay Peninsula, Borneo, and the surrounding smaller islands. In the Rhio-Lingga Archipelago, the small islands off the East-coast of Sumatra, gambir is grown in combination with pepper.

The plantations are mainly in the hands of natives or Chinese, only in Sumatra and in the Western Division of Borneo a few European owned estates are to be found. The largest European run plantations are those laid out in the Asahan district, Sumatra. These are owned by the "Goenoeng Malajoe Plantagengesellschaft" (a Swiss concern with head quarters in Zurich). At the end of 1921, the estates in this part of the island covered some 1,700 hectares (2,000 acres): 1,700 coolies (Javanese) being employed on these estates.

Climatic conditions have a great deal to do with a successful cultivation of the gambir plant. The climate must be damp and a rainfall of about 3,000 millimetres, regularly distributed over the entire year, with intervals of bright sunshine, are necessary. Such conditions only prevail in districts close to the equator, and for this reason only the central parts of Sumatra and the Western parts of Borneo are most suitable for gambir growing. Moreover, cultivation is only remunerative in the lowlands, for at a height of 1,200 to 1,500 feet above sea-level the yield of leaves is too small.

Under favorable conditions gambir grows rapidly, and if the plantations are properly looked after they begin to yield after one year; thereafter the leaves may be cut every six months. A properly managed plantation has a life of from 15 to 20 years, but native run plantations hardly ever reach this age. Some only pay during 5 or 6 years, and the best for not more than 12 years.

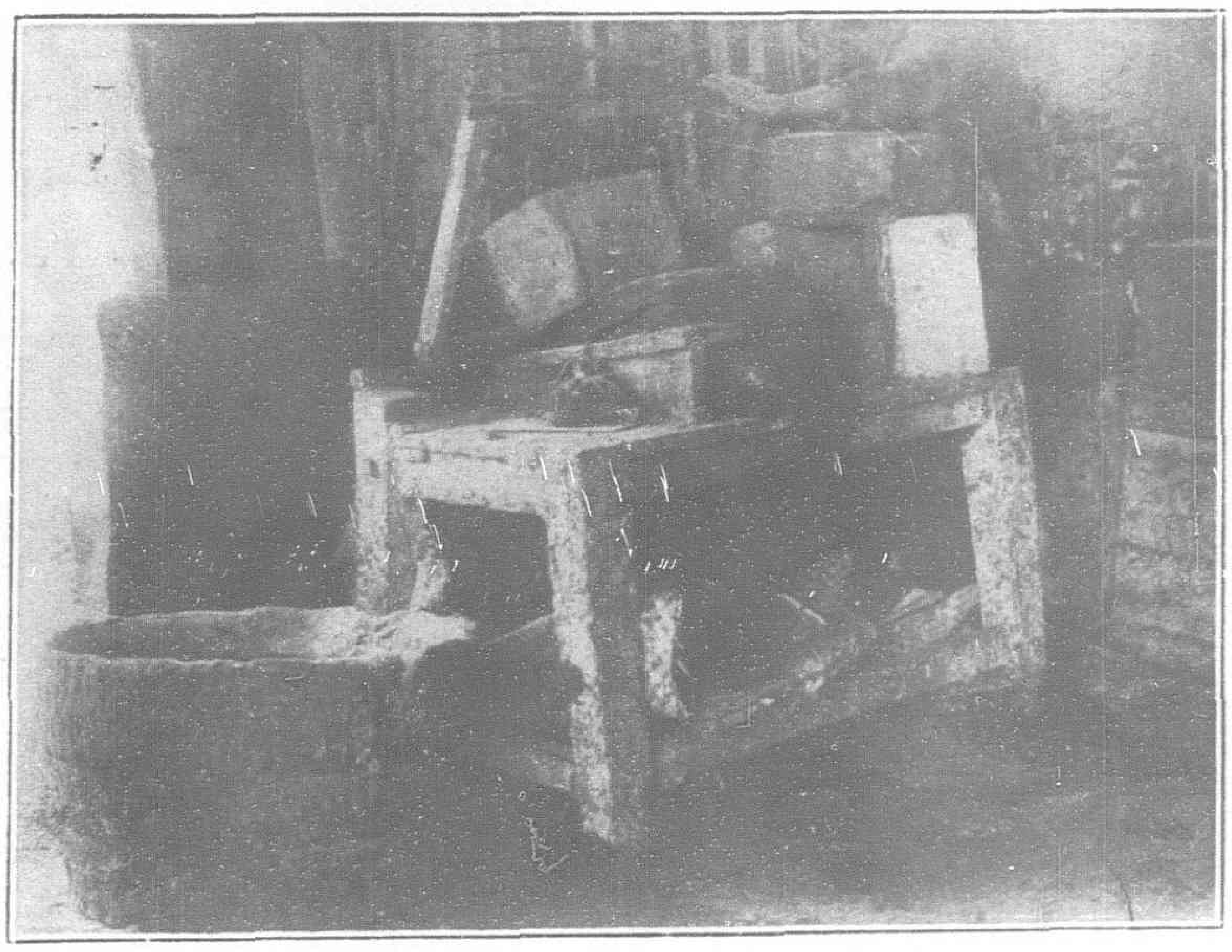
Harvesting is done by cutting the twigs, which reach a length of about two feet after six months, at a distance of about two inches from the main branch. On European managed estates this is done systematically and carefully, with the object that it may, like pruning, benefit the succeeding crop. Natives cut only about three quarters of the twigs. Not more leaves are collected than can be immediately milled, for dry leaves do not contain any trace of tannin and even faded leaves are difficult to make use of.

There are various methods of extracting gambir leaves. These vary according to the object for which the final product is destined, i.e. for native consumption or for the Western markets. We will here confine ourselves to the preparation of the material destined for export, which can be divided into "common" or "block gambir" and "cube gambir."

Immediately after having been picked, the leaves and twigs are conveyed to the factory which is, as a rule, situated close to the jungle with a view of being able to obtain firewood easily, and by preference near a brook. The building itself is a primitive, two storied, wooden house. The ground floor is made of hardened clay and on this is built, either of brick or clay, an oven upon which is placed a large pan made of iron or brass. A bottomless cask is then placed on the pan in order to prevent any liquid spilling over the sides. Above this emerges a wide, gently sloping gutter which can, by means of a movable pipe, be connected with a second cask intended for collecting washing water.

The leaves are boiled twice and are then, before being thrown away, washed in plenty of clean water. This water, which to a certain extent also contains tannin, is collected in the above mentioned cask and is again used to boil fresh leaves in, a minimum of wasteage being thus assured. The cask, as a rule, holds about 180 to 200 litres. After the leaves have been boiled once they are heated and again put into the pan to boil. The water is then strained and the leaves have to undergo their final washing. The leaves having been removed from the pan, another lot of fresh leaves, weighing from 180 to 200 kilos, is put into the still boiling extract and pounded and stirred with a big stick of hard wood. During the half hour that the fresh leaves are being boiled, the leaves which already have been boiled twice, are treated again with clean

Pickers of Gambir leaves in the plantation



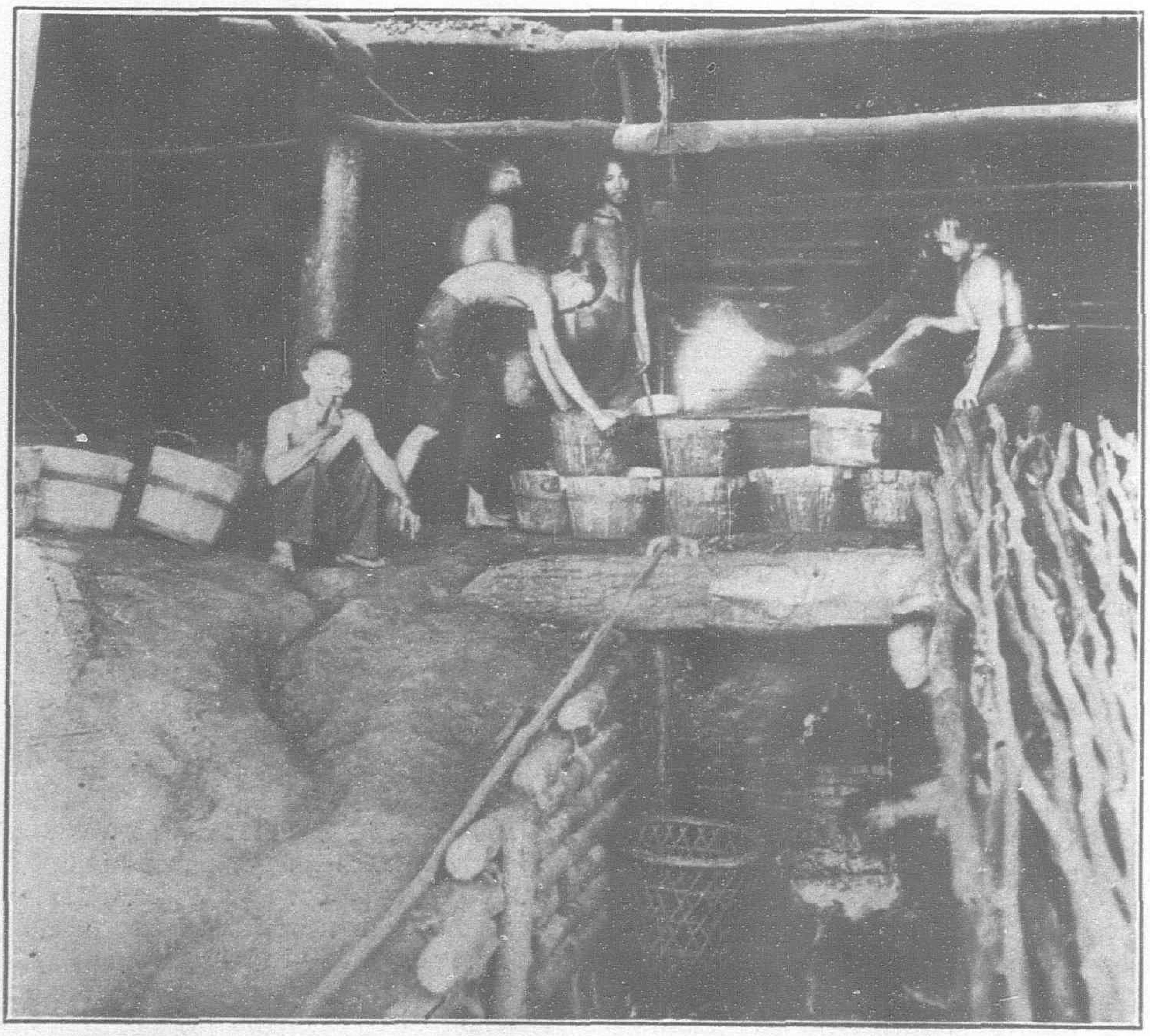
The cake is cut with strings the pieces thus obtained are further cut into cubes

water for the reason mentioned above. The refuse is then removed and, where the cultivation of gambir is combined with that of pepper, used as a fertilizer for the latter. When the drain has been emptied the contents of the boiling pan are attended to. The leaves are taken out and washed while the extract left in the pan is boiled till all the water has evaporated. The quantity is about 100 or 120 litres, and it takes from 3 to 4 hours before the necessary degree of concentration has been reached. The fire is then extinguished, the extract scooped out with a ladle and poured through fine sieves into small casks in which the surcharged solution coagulates as soon as the temperature has dropped to 35° C. When crystallization sets in, the soft paste is poured into wooden moulds in which it sets in about twelve hours. After being removed from the mould the material is cut to the required size and dried.

The product prepared in this way is known to the trade as " block gambir." It consists of the pure extract of the gambir leaves without anything being removed from, or added to it. The color is very dark both as regards the outside and at the fracture, owing to the high percentage of tannic acid and extracted substances.

" Cube gambir " is purer and quite dry, but somewhat less rich in tannin. When properly prepared, the color is light brownish red, and at the fracture light yellow. Cube gambir is really the product made by the Chinese for the Eastern markets although it is also extensively used in Europe and America. It is more expensive than " block gambir."

The native methods of preparation yield a product, relatively much richer in catechine than that produced by the Chinese. Unwittingly, advantage is taken of the difference in the solubility of catechine and that of tannin. The first named is hardly soluble in cold water but readily dissolves in hot, whereas tannin is easily soluble even in cold water.



Scooping out the extract and pouring it into small casks for coagulating

To produce cubes, the gambir extract is poured into moulds of a peculiar construction. Such a mould consists of a table which is covered with a course cloth, e.g. of jute, and is provided with vertical, detachable rims. A part of the tannic-acid containing moisture sickens through the cloth, and the remaining paste accordingly shows a relatively high percentage of catechine. When the cake has well set, the vertical sides of the box are removed and the cake is then cut with a string. The pieces thus obtained are further cut into cubes which are either dried directly in the sun or are first placed in the upper chamber for a time before being removed to a warmer place.

Premature heating would produce a plastic mass owing to the great solubility of catechine at a high temperature. After a fortnight or so the cubes are sufficiently dry to be packed and despatched.

The weight of the dry catechu prepared by the Chinese is to that of the cleaned leaves as one to six.

To prevent the cubes from losing their original shape whilst being dried—and therefore becoming useless for the Eastern trade, which retails the article by the piece and not by weight—it is necessary to mix some fine, well sifted and usually roasted, rice bran with the extract while it is still soft. The original shape is thus retained and the texture becomes more porous. The quantity required, however, is only small; 200 grammes of roasted bran to 10 or 15 litres of extract being sufficient. A high percentage of bran, which is often found in cubes prepared for chewing purposes, and which amounts to from 20

(*Continued on page 48.*)

"Rajputana"—A P. & O. Vessel

THE twin-screw mail and passenger liner *Rajputana*, built to the order of the Peninsular and Oriental Steam Navigation Company by Messrs. Harland & Wolff. Limited, Greenock, was successfully launched on August 6. The latest acquisition to the P. & O. line is a magnificent vessel of over 16,000 gross tons, and is classed 100 A. 1. at Lloyd's. Of imposing dimensions (she is 570-ft. by 71-ft. by 47.9-ft.), with a straight stem and cruiser stern, the new vessel is intended for the company's mail and passenger service between Bombay and London.

With the launch of the *Rajputana*, the P. & O. company have now no fewer than 91 vessels from this yard alone—a striking record of the intimate association and community of interests existing between these owners and builders.

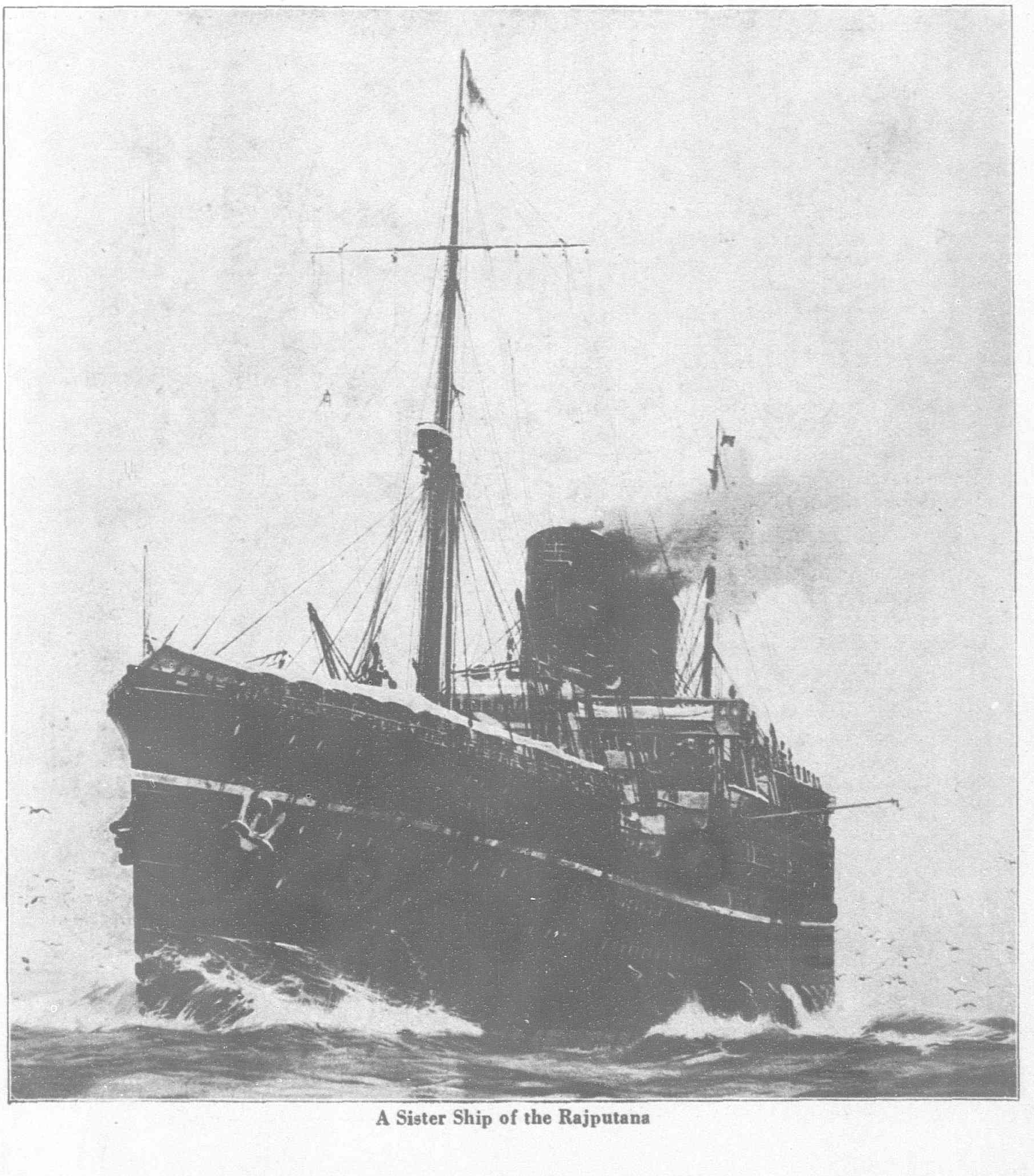
There are 12 watertight bulkheads extending to the shelter deck, dividing the vessel below the main deck into seven cargo spaces, cross bunker, two boiler rooms, engine room, fore-peak and after-peak. The double bottom extends right fore and aft, and is divided into compartments for the carrying of oil fuel, fresh water and water ballast. Water ballast can also be carried in the fore and after peaks.

The first class accommodation, which has been arranged on the promenade, bridge, shelter, and upper decks, is on a luxurious scale, lofty, comfortable and tastefully decorated, and provision has been made for 307 persons in this class. The accommodation provided for passengers in the second class is also of a thoroughly up-to-date character—the provision made for the comfort of these leaving nothing to be desired; 268 second class passengers being accommodated in a very superior manner.

The state rooms in every case have natural light and ventilation, an ample supply of water being laid on to wash basins throughout the accommodation, while the system of mechanical ventilation ensures the comfort and well being of the passengers in tropical climates. Single berth state rooms with cot beds have been fitted to an unusual extent, and a number of two berth suite rooms are also provided. All the public rooms in connection with both first and second class accommodations are airy and spacious, and are being decorated in a most artistic manner under the direction of Viscountess Inchape and with the assistance of the Honorable Elsie Mackay.

Special consideration has been given to every detail of construction and outfit affecting the safety of the ship. In addition to the water tight sub-division afforded by the 12 bulkheads already referred to, the provision of closely sub-divided oil bunkers along the ships side, in way of the boiler rooms forms an additional safeguard of undoubted value. A complete installation of hydraulic cargo gear is installed to ensure expeditious and silent handling of cargo, while the electrical installation is of a very complete character for illumination, heating, and power purposes.

The propelling machinery of the *Rajputana*, which has been constructed at the builder's Belfast Works and will be fitted on board at Greenock, consists of two sets of quadruple expansion engines of the balanced type of about 15,000 i.h.p. supplied with steam at 215 lbs. pressure by six double-ended cylindrical boilers fitted with forced draught and arranged for burning oil fuel. In all parts of the vessel wherever possible Bitumastic solution and enamel has been used.



A Sister Ship of the Rajputana

New B. I. Vessel—The *Shirala*

Messrs. R. and W. Hawthorn, Leslie & Co., Ltd., launched from their Hebburn Shipbuilding Yard on August 5, the twin screw steamer *Shirala*, building to the order of the British India Steam Navigation Company Limited. The description of the vessel is as follow: — Lengths overall 451 feet; breadth 57 feet 6 inches; depth 36 feet 6 inches.

The vessel is being built to Lloyd's 100 A. 1. class and is constructed with straight stem and elliptical stern, with upper, bridge, forecastle, promenade, and boat decks. A very efficient arrangement of derricks is fitted for the rapid handling of cargo and in addition to this a special 30-ton derrick is fitted for dealing with heavy lifts.

Accommodation for first and second class passengers is being fitted up in a spacious manner, the rooms being plainly but tastefully furnished. The public rooms are of large size for the number of passengers carried, and include first-class lounge, first-class smoke room, first-class saloon, second class lounge, smoke room and second-class saloon. They are all decorated and furnished in a most up-to-date style suitable for a vessel trading at home or abroad.

The captain's rooms are situated on the flying bridge, the officers and engineers being berthed in houses at the fore and after ends respectively of the boat deck. Wireless telegraph installations will be fitted, with berths for the three operators situated in officers' house on boat deck. Two hospitals are provided. Refrigerated chambers are situated between the main and upper decks. Mails and specie will be carried, and special rooms are being fitted for this purpose.

The vessel will be propelled by twin-screw engines of the triple-expansion direct-acting surface-condensing type, constructed at the St. Peter's Works of the builders. The engines are designed throughout in accordance with the most up-to-date practice for refrigerating machinery. A very complete range of auxiliaries is fitted, including main and harbour feed pumps, and independent circulating pumps. Thrust block is of the Michel patent type with enclosed lubrication. Steam is supplied by five single-ended cylindrical boilers working at 215 lbs. pressure under Howden's latest system of forced draught.

Trial Trip of P. & O. *Ranchi*

This vessel has just run a most successful trial. Her dimensions are as follows:—Length overall 570 feet; beam 71 feet; depth 47 feet.

The *Ranchi*, a handsomely modelled passenger and mail steamer with two funnels, is the second of the two sister ships built by Messrs. R. and W. Hawthorn, Leslie & Co., Ltd. at their Hebburn Shipbuilding Yard, for the Peninsular and Oriental Steam Navigation Company, and she will take her place in the company's service between London and Bombay. She has seven decks in all and is designed on the most up-to-date lines, particular attention having been directed to the comfort of passengers travelling in tropical climates.

The first saloon is decorated in a French style. The lounge, music, room and smoke room are designed with high ceilings, skylights and large bay windows. The lounge itself is decorated in a "Georgian" style, while the music room is finished after an "Adams" period room. The furniture in the various rooms is a reproduction of that found in rooms of the respective periods, as also is the case with the tapestry. The smoke room, an old English "Tudor" design, is one of the main features of the ship, finished in a grey-colored oak, with its characteristic small square panels broken here and there by vertical oak and plaster strap work so often seen in many of our "old world" towns. The smoke room opens out on to a verandah. The cabin accommodation is particularly spacious and well lighted, each cabin having a port light through ship's side, and special arrangements are made where by each passenger has a constant supply of fresh air available. A passenger lift is fitted between all the passenger decks on the ship, this facilitating access to public rooms and the passenger accommodations. A number of "special" cabins are situated on "B" deck, each having separate bath rooms . Large promenade decks are arranged where passengers can sit in the shade, and special places are allocated to deck games. The ship is provided with two hospitals, dispensing rooms, and surgery.

The second saloon accommodation is designed on similar lines to the first saloon, with dining room, lounge, and smoke room. These rooms are all tastefully panelled out, and the latter are fitted with large bay windows. The galleys and pantries, together with the bakeries, butcher's shop and sculleries, are situated between the first and second saloons, occupying a considerable space amidships and are fitted with every cooking appliance for the Company's "a la carte" service.

The *Ranchi* has seven cargo holds which are divided up into mail rooms, bullion rooms, insulated spaces and bulk cargo holds, and they are served by a most efficient installation of hydraulic cranes for the rapid handling of all cargoes. Two cranes are fitted to each hatch.

The propelling machinery, constructed at the St. Peter's Works of the shipbuilders, is of the most up-to-date type of reciprocating machinery, and comprises two sets of four-cylinder quadruple expansion engines, balanced on the Yarrow-Schlick and Tweedy system. The engines are fitted with Messrs. Brown Bros, direct acting hydraulic reversing engine, and turning engines of the two-cylinder two-crank type are fitted for each main engine. The main condensors of the "Uniflux" type are fixed to the back columns of the engines. Auxiliary machinery of the latest up-to-date practice is fitted to ensure the best possible economy, efficiency, and reliability on the exacting service on which the vessel will be employed. Thrust blocks of the patent "Michell" type are fitted to the main shafting. The propellers are fitted with adjustable manganese bronze blades. The boilers are of the multitubular type six in number, double-ended, constructed for burning oil fuel on the "Clyde" system in conjunction with Howden's forced draught. The oil fuel burning installation is in duplicate, each unit being of sufficient capacity for working the machinery at full power. The refrigerating plant has been supplied by Messrs. J. and E. Hall, Ltd. of Dartford.

Japanese Electrical Industry

IT is reported that, consequent upon the great decrease in its revenue and in order to relieve the dullness of trade, the Imperial Government Railways Department has resolved to purchase all requisites from Japanese manufacturers, excepting small products which cannot be made in the country. Further, Japanese industrial concerns are stated to have a predilection for foreign electrical machinery and apparatus, and those interested in the future well-being of Japanese electrical engineering industry are very much exercised by this tendency. The Electrical Association is understood to have decided to make extensive and thorough investigations regarding the weak and defective points in Japanese products, through a committee that has been set up. This committee consists of representatives of 36 electrical machinery manufacturers, including several well-known companies, also of the Tokyo Municipal Electrical Bureau, while the Department of Communications, Railways, and of the Army and Navy are to be asked to co-operate in the inquiry.

The subject was recently touched upon in an article in the *Electrician's Friend*, written by Mr. S. Mayebara, the chief of the Engineering Section of the Electric Bureau of the Communications Department. Though he was able to give figures showing that the Japanese electric power supply industry was making steady progress, and that a large amount of new generating plant was in course of erection, he had to deplore the Japanese inclination to indiscriminately favor foreign production, especially at a time when it was claimed that Japan produced hydro and steam plant "not so inferior to the foreign products" as a correspondent expresses it in a communication to ourselves. Mr. Mayebara is reported to have urged Japanese engineers to use as much Japanese product as possible, even at the sacrifice of convenience, in order to develop the Japanese electrical machinery and apparatus industry.

With regard to new work in contemplation, we understand that the Imperial Government Railways Department has decided to commence upon the construction of the Shinano-gawa hydro-electric power station in the fiscal year 1926-27. The Osaka municipality has large extensions to its electric power system in prospect. Mr. Amenomiya, the chief of its Electricity Department, has been indicating vast expansion ideas for the next seven or eight years both in respect of power supply and in electric transportation. The 10,000-k.w. generators for the Kujo power station, which is part of the scheme, were recently obtained in England. Further additions of 20,000 to 30,000 k.w. per year are contemplated for some years to come, subject to the approval of the loan scheme by the Department of Finance.

Japanese Petroleum Production

JAPAN has never been a large producer of petroleum, says a recent report of the U.S. Geological Survey. Production, which began in 1875, yielded only 61,817 bbls. in 1890; about 870,548 bbls. in 1900; 1,825,098 bbls. in 1910; and 2,942,722 bbls. in 1916; but only about 1,947,000 bbls. in 1924. To the world production of crude petroleum Japan contributed only 0.2 per cent. in 1924. Her total contribution to the world's production from 1875 to 1924 has been only 49,000,000 bbls., or 0.4 per cent. of all oil produced in the world from 1875 to 1924. Among the countries of the Orient, Japan stands a poor fourth in production. Whereas the Dutch East Indies and Persia each export annually several million barrels of crude and refined oil, Japan must import considerable quantities of petroleum. The climax of production was reached in 1916, when 2,942,722 bbls. was produced. Since that year the output of crude petroleum in Japan has shown a progressive decline. The falling off in crude oil production since 1916 was at first attributed to the stoppage in the importation of well-drilling machinery and supplies. Since the ban on the importation of these articles was removed in 1919, the expected increase in production has not been realised. This decline, occurring at a time in the world's history when the competition for supplies of petroleum, both mined and unmined, is at its keenest, has occasioned grave and ill-concealed concern on the part of the Japanese oil industry and the Japanese Government. The Japanese crude oils are inadequate not only in quantity but in quality. They are for the most part heavy oils with an average density of 25° A.P.I. (specific gravity 0.903), deficient in gasoline and benzine. The refineries are able to maintain their output of these lighter fractions only by distilling large quantities of imported crude.

About two-fifths of the refined oils, waxes, greases, and bitumens consumed in Japan are imported chiefly from the United States and the Dutch East Indies. For many years the Japanese petroleum industry has striven to free itself from the competition of these foreign refined oils. Crude petroleum has been imported from the United States and the Dutch East Indies to be refined in Japan. This policy was apparently successful down to 1917 or even to 1918; the Japanese press could point triumphantly to the increase over pre-war days in the proportion of refined oils furnished by the domestic refineries. But in 1918 the decrease in the production of crude petroleum was becoming obvious; the two succeeding years brought a still more diminished output of crude. Imports of crude oil to eke out the declining domestic supply promptly jumped in 1919 to double the 1918 figure, and in 1920 exceeded the pre-war level. Still the output of the Japanese refineries decreased progressively from the peak of production in 1917. At the same time the growth in the manufacturing industries and the higher standards of comfort have caused an increase in the consumption of refined oils from 2,990,000 bbls. a year before the World War to 3,284,000 bbls. a year since the war. The shortage had to be made up by increased imports of refined oils. Moreover, the consumption of gasoline and benzine has increased at the expense of kerosene, which was formerly the chief mineral consumed. As the Japanese crude oil is deficient in these lighter fractions, this has caused an increased dependence on the importation of higher grade foreign crude.

The problem of a petroleum supply soon forced itself on the attention of the political and commercial leaders of Japan. The Government at the end of 1921 adopted a comprehensive programme of its future petroleum policy, which embraces the following points: Investigation of the yet unexplored oilfields of Japan and her colonies; modernisation of the industry of the already explored fields; furtherance of work of investigation and prospecting of the unexplored oilfields, especially by financial support; study for the purpose of creating substitute fuels; investigation of the economic utilisation of fuels; increase of the import duties on petroleum products; methods of control of oil production; obtaining of foreign oilfields; increasing the importation of crude oil. So far as regards the development of her own oil production, the programme can hardly secure a real improvement; only in Sakhalin, according to previous prospecting work, do very favourable prospects occur, and these, indeed, in the northern or Russian part of the island, which has been occupied by the Japanese only since the Russian revolution. Japan's efforts to bring under Japanese control promising oilfields in the Djambi district of Netherlands India have so far miscarried. The search for new supplies of crude oil began in the Japanese islands, extended to the Japanese with dominions, and finally to foreign countries. No important new fields have been discovered in Japan proper. Drilling in Taiwan (Formosa) has been disappointing. Karafuto (Japanese Sakhalin) apparently offers little hope of productive oilfields. Japan's best opportunities for obtaining new supplies of mineral oil appear to lie outside Japanese territory, in Northern or Russian Sakhalin and in Manchuria. In Northern Sakhalin petroleum has been obtained, but production is not yet on a commercial basis. In Manchuria preparations are being made to distill abundant and easily accessible beds of moderately rich oil shale.

The principal oil-yielding belts in Japan are almost parallel to the coast of the Sea of Japan, with some interruptions, from latitude 45° 30′ north southward to latitude 37° north. On the southern or Pacific coast a little oil has been produced between Suruga and Ise Bays. Petroleum has been found in Japan only in the Miocene and Pliocene series of the upper Tertiary. These series have been studied in detail by many geologists, and it is clear that, although there are certain different peculiarities in the oil-bearing strata in the various districts, they have, on the whole, similar characteristics and are of the same geological horizon. The oil-bearing strata consist of sandstone, tuff and fractured shale, in which oil is found associated with salt water. There are many oil-bearing formations, of which the most productive are the middle and lower divisions of the upper Tertiary, of Miocene age. In these the sandstone and tuff are the chief oil carriers, though some oil is obtained from the shale. As regards the origin of oil in the oilfields of Japan, opinions of the Japanese geologists and chemists vary greatly, but it is accepted by all that oil is of organic origin, and had its origin in the Tertiary sedimentary rocks. The black or dark grey shales that are so widely found in the Teriary formations, especially in the middle Tertiary, contain much organic matter, and in or near them are found bituminous substances and rich oil pools. These facts suggest that the oils originated in the black or dark grey shales. The richer accumulations of oil occur, without exception, on anticlinal, domal, or terrace structures. The developed oilfields are all on anticlinal ridges. In Japan proper there are four producing districts. Three of these are on the island of Honshu; the Echigo district, in the Prefectures of Niigata and Nagano; the Akita district, in the Prefectures of Akita and Yamagata; the Totomi district, in the Prefectures of Shizuoka and Aichi. The other is the Hokushu district, in the Prefecture of Sapporo, on the island of Hokushu (Hokkaido or Yezo).

In an effort to extend the oil-producing area of Echigo to the north, the Murakima Field in the northern part of the Prefecture of Niigata has been prospected. The Tertiary beds are folded into two anticlines and three synclines and cut by six faults, all trending north-south or north-north-east—south-south-west. In the main part of the field five wells were drilled by both cable and bamboo spring pole systems to depths ranging from 66 to 836 feet. In the southern or Nakajo portion of the field are many dry holes, of which the deepest struck the underlying granite at a depth of 1,333 feet. In the nearby Haguro Field about 40 wells drilled by the cable system to depths varying between 330 and 1,351 feet have yielded only small quantities of oil. In density the oil won in the Echigo district ranges from less than 15° to 45° A.P.I. (specific gravity 0.9659 to 0.8017). The heavier oils occur in the higher strata. Oils from the Kubiki black shale, as at Kubiki and Amaze, have an average density of 40° A.P.I. (specific gravity 0.8251), and those from the middle sandy shale, as at Niitsu and Ushirodani, have a density varying from 15° to 20° A.P.I. (specific gravity 0.8659 to 0.934). In the same field, or even in the same wells, oils from the lower formations are of higher grade than those from the upper, as at Miyagawa and Nagamine-Kamada. Where igneous rock has been intruded into the oil-bearing strata the oil in many places is thick and heavy, with a density less than 10° A.P.I. (specific gravity 1.000). The oils belong mainly to the naphthene series, and resemble the oils of the Baku district. Some of the Echigo oils contain small percentages of the paraffin hydrocarbons. In the refineries of Niigata Prefecture the domestic crudes yield an average of 4.8 per cent. gasolene, 31.4 per cent. kerosene, 31.5 per cent. solar oil, 13 per cent. fuel oil, 17.6 per cent. lubricating oils, 0.1 per cent. paraffin, and 1.6 per cent. pitch.

In the Prefectures of Akita, Yamagata and Aomori, in the north-west art of Honshu, the oil fields parallel the coast line for about 20 miles. The surface of the oil districts is occupied by hills or low mountains not more than 1,000 feet in height, which have a general north-easterly trend. These hills and mountain ranges usually coincide with the anticlinal folds in Tertiary strata, and the valleys between them are mostly synclinal. Accumulations of oil occur only on anticlinal or domal structures. The strata in most places are generally folded along north-north-east—south-south-west lines, with dips not exceeding 30°. The producing fields lie north and south of Akita city. The Kurokawa oilfield, 9 miles north of Akita city, famous for a gusher that produced 10,000 bbls. a day, is situated on an elongated dome on which the inclination of the strata averages 20°. The Toyokawa oilfield is on a terrace, and the oil occurs in fractured zones of the black shale. The Michikawa oilfield, 5 miles north of Akita city, is in the grey shale, which forms an elongated north-trending dome. From 2 to 20 miles south of Akita city extends the Kameda Field. Here Tertiary beds are folded and faulted along north-south lines. The principal structures of interest are the Kimiganogawa anticline ; the anticline east of Uchimichikawa ; the anticline near Katte ; the Katsurane Dome ; and the anticline at Toyoiwa. Oil is produced commercially from the Uchimichikawa, Katte, and Katsurane anticlines. Efforts to extend the Akita fields to the south and south-east by drilling have not yet been successful. In the Wada Field, 6 miles south-east, four wells have been drilled, two by the native bamboo spring-pole system and two by the cable system to depths ranging from 1,340 to 1,560 feet, without success. In the eastern part of the field, since 1916, six test wells have been put down without success, three by the cable-tool system to depths of 922 to 1,145 feet and three by the native bamboo spring-pole system to depths of 241 to 305 feet. In the southern part of Akita Prefecture two test wells are now being drilled, one by the cable-tool system and one by the native bamboo spring-pole system. A similar lack of success has so far met all efforts to extend the Akita fields to the north and north-west. On the Oga Peninsula, north-west of the city of Akita, lies the Ogashima Field. From 1915 to 1917 four wells were drilled, two by the cable system and two by the native bamboo spring-pole system, to depths of 886 to 1,574 feet, without result. Three wells drilled on the Kanaoka anticline, west of Onozawa, in 1916-19 were unsuccessful. On the Tomine anticline a well was drilled in 1917-19 by the cable-tool system to a depth of 1,308 feet without result. On the Nigorigawa anticline a well drilled in 1920 by the cable method to a depth of 582 feet yielded 10 bbls. of oil daily. Two wells by the native bamboo spring-pole system yielded each 1 bbl. a day of asphaltic oil of 14° A.P.I. density at depths of 612 and 642 feet. A well drilled by a cable rig one mile to the south gave only a small quantity of oil at a depth of 870 feet. On the Nagaomote anticline three wells were drilled in 1919-20 by the cable-tool methods to depths ranging 464 to 1,594 feet, but proved unsuccessful. At Futatsui, from 1916 to 1922, five wells were drilled, four by the cable system and one by the rotary system, to depths ranging from 1,000 to 3,510 feet, but without success. East of Futatsui, from 1916 to 1922, six wells were sunk in the villages of Ochiai, Shimo-Ono, Nanakura, and Fujikoto, two dug by hand and four by the native bamboo spring-pole system, but without result. A well is being drilled by the cable system at Shimo-Ono.

A little production (300 bbls. a year) is obtained from shallow wells in the Prefecture of Yamagata. Drilling on the Takinosawa Dome, in the centre of the field, by the Japanese spring pole system in 1923, revealed traces of oil and gas at a depth of 364 feet. The Hanezawa Dome was drilled to a depth of 1,776 feet by the cable system, and the Tano-sawa Dome to a depth of 889 feet by the bamboo spring-pole system without result.

Very little oil has been obtained in the Prefecture of Aomori. In the Daishaka Field, a number of shallow wells have been drilled in the last 35 years down to the Pliocene without success. At Yoshinoda a well drilled by the cable and rotary systems to a depth of 3,240 feet found slight indications of oil in the upper part of the Miocene. At Masdanome, wells drilled on the west flank of the Umanokami-yama anticline obtained only a small production of petroleum. Although a little oil had been produced in the Akita district for several years, its sudden rise as a producer dates from the opening of the Kurokawa gusher in May, 1914, with an initial production of 12,000 bbls. daily. The discovery of the Toyokawa and Michikawa pools increased the yield of the district until in 1921 it exceeded the production of the Echigo district. In 1922 the Akita district produced 44 per cent. of the total output of Japan.

A number of gushers have been struck in the Akita district, several of which yielded 10,000 to 12,000 bbls. a day when the wells were first brought in. But the gas pressure soon decreases, and after a flow of several months the well generally has to be pumped. Water is very troublesome, and difficult and expensive to control. The crude oil of the Akita district has an asphaltic base, is brown in colour and averages in density 22.80° A.P.I. (specific gravity 0.917). It yields in the refineries little or no gasoline, 13.6 per cent. kerosine, 8.9 per cent. solar or gas oil, 76.5 per cent. fuel oil, 0.7 per cent. lubricants, and 0.1 per cent pitch.

In the Totomi district, on the western shore of Suruga Bay, in the Prefecture of Shizuoka, shallow sands in the Tertiary have been exploited by primitive methods at Sagara, about 100 miles southwest of Yokohama. The oil occurs in a bed of loose sandstone, 3.3 feet thick, and in places in shale also. Seepages are numerous. A small production, less than 1,000 bbls. a year, has been obtained. Drilling by modern methods to a depth of 1,400 feet has not increased the yield. The oil has a density of 43° A.P.I. (specific gravity 0.811) and yields on distillation 11.3 per cent. gasoline, 40 per cent. high grade kerosene, 25.4 per cent. solar or gas oil, 6.9 per cent. fuel oil, 17.4 per cent. lubricating oils, and 0.1 per cent. pitch.

The Tertiary formations in Hokushu have been repeatedly subjected to severe mountain-building forces and are much folded or deformed. Some of the many wells drilled along the anticline produced as much as 250 bbls. a day. Two long anticlinal folds extend southward from Kitami Province to Teshio Province. Several wells have been drilled and some of them less that 1,100 feet deep reached oil pools. The Wakkanai anticline on the west is 8 miles long. Two or three wells have been drilled on it, and fairly rich pools were found at a depth of 2,500 feet. Petroleum was found in Hokushu in 1903, when the International Oil Co.,a subsidiary of the Standard Oil Co. of New Jersey, brought in a flowing well of heavy oil at Hachemancho, in the Province of Ishikari. The Nippon Oil Co. took up development work here in 1904, and the Hoden Oil Co. in 1905. The Hokushu district has been only spasmodically developed. The production has averaged only 7,000 bbls. a year.

Large Contracts for Indian State Railways

Notwithstanding fierce competition by various foreign firms principally American, German and Czechoslovakian companies, the famous form of Messrs. Cammell, Laird and Co., have secured two large orders for steel railway coaches.

These orders consist of one for 280 broad guage steel coaches for the Indian State Railways, and one for 160 coaches for the Bombay and Baroda Railway Company, in connection with the big electrification scheme in India. The work is to be carried out at Nottingham and Leeds and at the various railway centres of the affiliated companies. The construction of the coaches involves a large sum and the employment of considerable numbers of skilled workers.

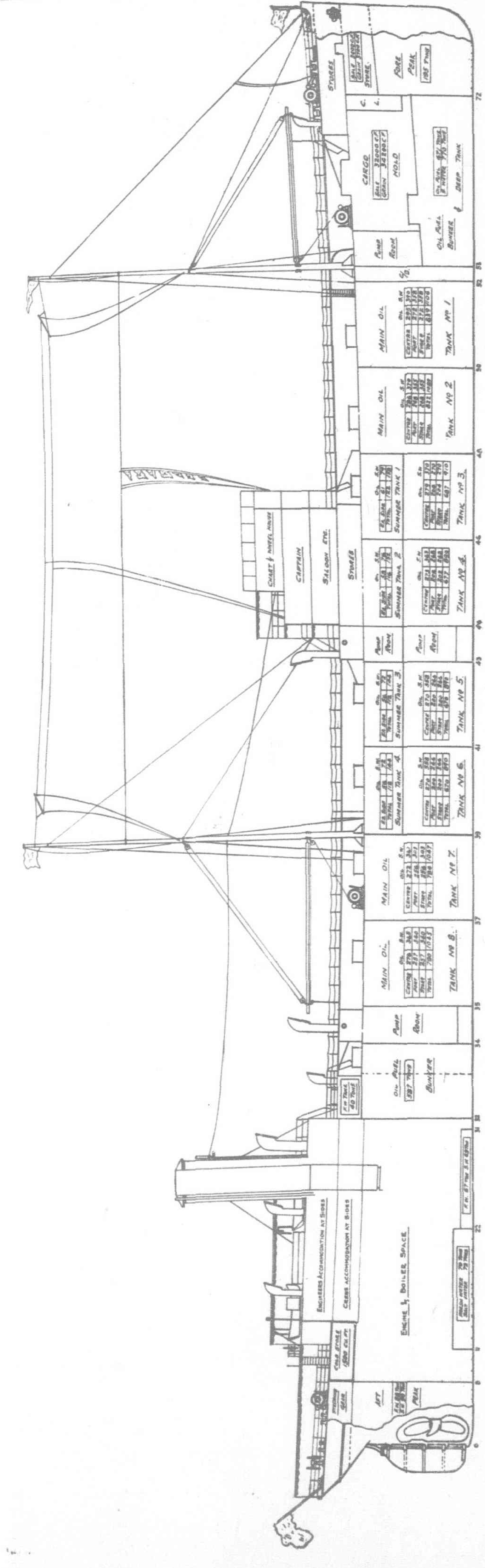
The placing of these two contracts is looked upon in the City as a good omen in the trade outlook, because several good railway contracts have of late gone to the Continent. In past years Messrs. Cammell, Laird and Company have carried out a number of large Indian railway contracts.

It is noteworthy that tenders for these latest contracts were publicly advertised, and there was world-wide competition. Messrs. Cammell, Laird and Co., and their associated firms, the Leeds Forge Company, Limited, and the Midland Railway Carriage and Wagon Company Ltd., of Birmingham, pooled their resources, and by improved methods, machinery, and designs, got their costs so low that they were able to quote competitive prices against all comers.

The Oil Tanker "Mobiloil"

ANOTHER very interesting launching has recently taken place in the oil tank vessel *Mobiloil*, which has been built at the Greenock Dockyards, to the order of the Vacuum Oil Company, Ltd. The vessel is an addition to the company's fleet, for the carriage of Gargoyle lubricating oils in bulk. The principal dimensions are:—Length, between perpendiculars 394 feet; breadth 54 feet; depth, 28 feet 9 inches.

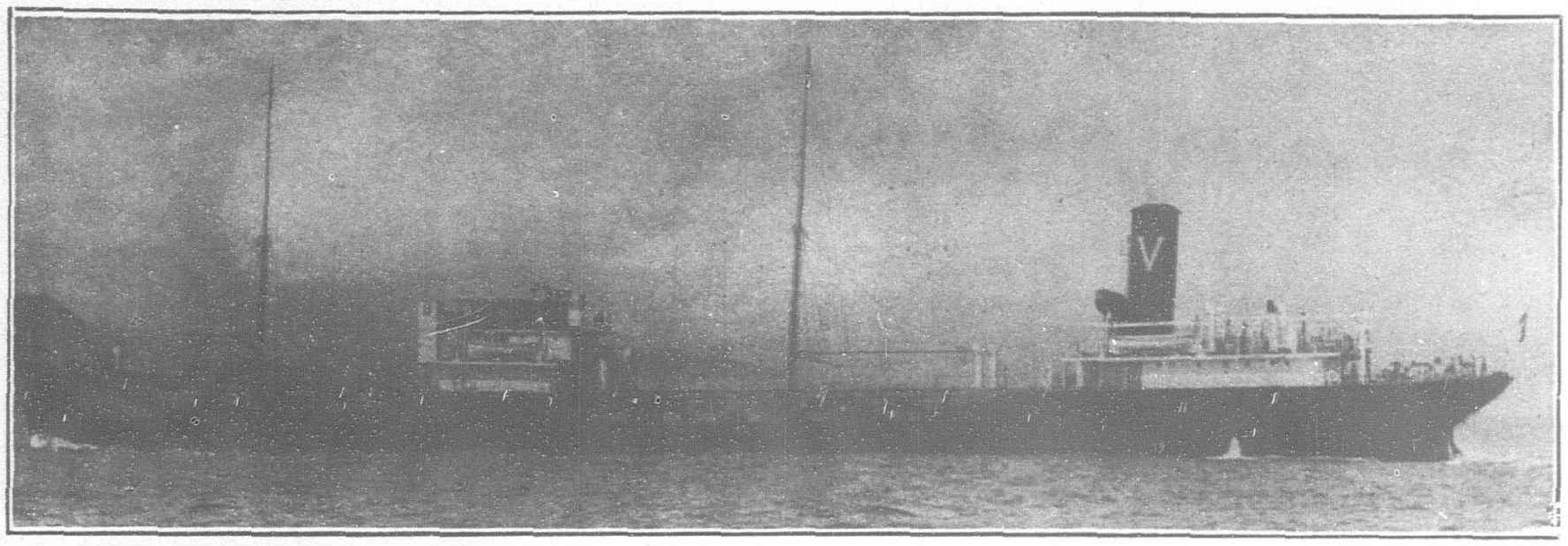
The vessel is built on the Isherwood system, except in the way of peak tanks, and to Lloyd's highest class for hull, boilers, machinery and general equipment, and will also comply with the Board of Trade requirements for this class of vessel. The total deadweight is 7,250 tons on a mean draft at sea not exceeding 23 feet, and to Lloyd's summer freeboard. Eight main cargo tanks, with oil-tight transverse bulkheads are provided, each tank being subdivided by two continuous longitudinal oil-tight bulkheads running fore and aft, extending to the upper deck, so as to divide each tank into three compartments of about equal size. Four summer tanks, each about 50 tons capacity, are provided in each side in way of Nos. 3, 4, 5, and 6 main tanks. Two pump rooms are provided, one amidships between Nos. 4 and 5 main tanks, and one between No. 8 tank and fuel bunker, forming combined pump rooms and cofferdams. The usual oil-tight cofferdam is provided at the forward end of the vessel. A large oil fuel bunker is provided between the after pump room and boiler room, and the deep tank forward is also arranged to carry fuel oil. Double bottom tanks are arranged under after boilers and under engines, with water tight center keelson. The double bottom tanks are arranged for boiler feed water as well as sea water ballast.



Plan of the "Mobiloil"

The bridge space is fitted out for stores. Accommodation for captain and pilot is arranged for on the upper bridge deck, in a steel house, with separate office room for the captain. Wheel and chart rooms are arranged in a large teak house above the captain's accommodation, in which will be installed a Sperry Gyro steering apparatus. Accommodation for three officers is arranged on the bridge deck, including saloon, pantry, w.c. and bathroom, steward's room, Marconi operator's room and operating room, and room for Sperry master, compass, etc. The wireless is being installed by the Marconi company. Engineers will be accommodated in steel houses on the poop deck, and crew and firemen in the poop space below.

The machinery is placed in the after part of the vessel and consists of an inverted direct-acting triple-expansion engine, having three cylinders, 27 inch, 44 inch, and 73 inch diameter with 48 inch stroke, taking steam at 180 lbs. pressure from three large single ended cylindrical return tube boilers, 15 feet internal diameter by 12 feet long, fitted with three corrugated withdrawable furnaces. The boilers will be fitted for burning liquid fuel on the Todd oil-burning system, combined with Howden's forced draught. The engines are estimated to develop about 2,500 i.h.p. Refrigerating machinery and large cold store provision chambers are provided at the after end of the poop space. In each of the forward and after main pump rooms three duplex cargo oil pumps of ample size are being fitted, and are so arranged that they will pump from any oil compartment and deliver simultaneously to connections at deck through separate discharge pipes. Drain pumps will be fitted, one in each pumproom. One horizontal duplex cargo pump is also being fitted in each summer tank pumproom for separately dealing with the cargo in the summer tanks. The main and summer tanks, fuel oil bunkers, and deep tank forward will be fitted with steam heating pipes of large heating surface. Two fresh water tanks of 20 tons capacity each will be fitted in the poop space. A combined steam and hand windlass will be fitted on the forecastle deck. A large hold is provided at the fore end of the vessel above the deep tank for the carriage of oil in cases or barrels as required, and abaft this a four deep pump room is situated in which the oil fuel transfer and ballast pumps are fitted. Three steam winches of ample size are being fitted on deck. A Brown combined steam and hand tiller is provided, the engine being controlled by telemotor system, operated from the wheel house and also from a mechanical control aft. Electric light is on the most up-to-date principle Bitumastic solution and enamel have been applied in engine and boiler spaces and practically throughout the whole of the vessel.



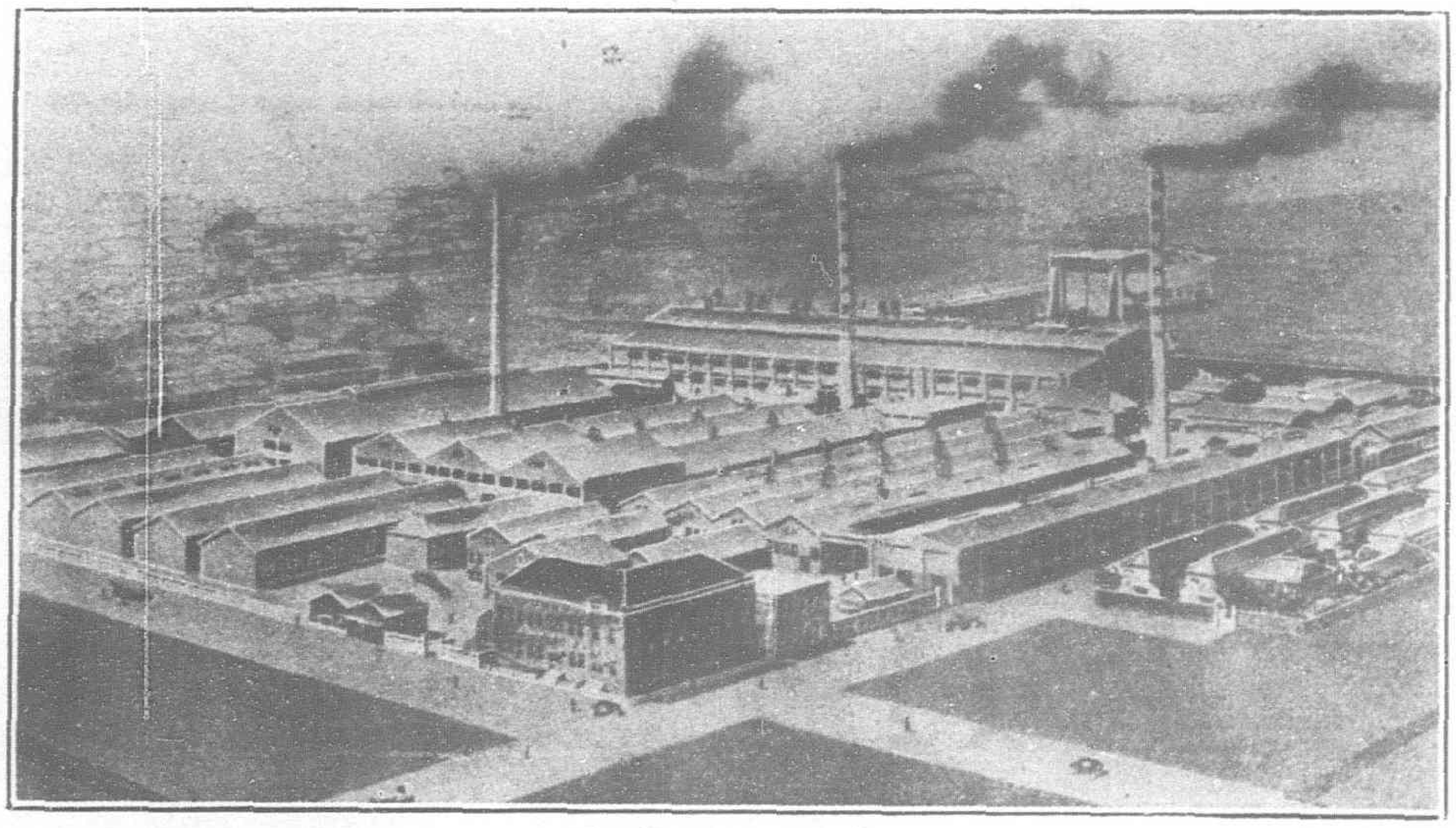
The " Mobiloil "

Fujikura Insulated Wire Co., Ltd.

THE Fujikura Insulated Wire Co., Ltd. was originally established by Mr. Z. Fujikura, after whom is derived the name of the Fujikura Densen Kabushiki Kaisha. Mr. Z. Fujikura was really the originator of this line of business in Japan, he having begun manufacturing electric wires in Tokyo as early as 1885. His works at that time were naturally on a small scale and equipped with machinery of primitive design.

In the intervening 33 years the works developed into their present size and capacity through the ceaseless efforts and ability of Mr. T. Matsumoto, who is the president of the present Fujikura Densen Kabushiki Kaisha and the successor to the late Mr. Z. Fujikura.

In 1885 when there were no electric companies in Japan, the Fujikura Insulated Wire Co., Ltd. introduced an arc-lamp which was lit for demonstration on the Ginza, the most busy street of Tokyo. Several years ago, the company selected a site at Susaki, Fukagawa, for its modern factory, which was being constructed when the disastrous earthquake occured in September, 1923, and though the progress of the work was greatly handicapped by the disaster, the workshops, covering an area of 8,000 *tsubo* have been recently completed on the ground of 25,000 *tsubo* in area.



The Fujikura Works

Among the workshops of this company, the electric cable works are on the largest scale. The upper floors of the works are mainly intended for the manufacture of rolled paper and paper tape. Manila paper, and insulated paper are principally supplied from the Tomoegawa Paper Mill, Ejiri, Shidzuoka prefecture in which Fujikura has large investments.

The products are to be carried to the canal just outside the works and there, they are loaded on board ships by means of jib crane.

Trial Trip of New British India "Shirala"

THE handsomely modelled twin screw steamer *Shirala*, built and engined by Messrs. R. & W. Hawthorn, Leslie, and Co., Ltd., for the British India Steam Navigation Co., Ltd., ran a successful trial off the River Tyne towards the end of October, after which she proceeded to take up her sailings. The following is a brief description of the vessel. Length overall, 451 feet; breadth 57 feet 6 inches; depth 36 feet 6 inches. The vessel is built to Lloyd's 100A. 1. class, and is constructed with straight stem and elliptical stern, with upper bridge, forecastle, and promenade decks. A number of derricks is fitted for the rapid handling of cargo, and a special 30-ton derrick is fitted for dealing with heavy lifts.

Accommodation for first and second class passengers is fitted up in a spacious manner, the rooms being plainly yet tastefully furnished. The public rooms are of large size for the number of passengers carried and include lounge, smoke saloon and dining room for first class passengers, and lounge smoke-room and dining saloon for second class passengers; they are all decorated and furnished in a most up-to-date style. The captain's rooms are situated on the flying bridge, the officers and engineers being berthed in houses at the fore and after ends respectively of the boat deck. Two hospitals are provided. Refrigerated chambers are situated between the main and upper decks. Mails and specie will be carried for which special preparations have been made.

The vessel is propelled by twin screw engines of the triple-expansion direct-acting surface-condensing type, constructed at the St. Peter's works of the shipbuilders. The engines are designed throughout in accordance with the most up-to-date practice for reciprocating machinery. A very complete range of auxiliaries is fitted, including main and harbour feed pumps, and independent circulating pumps. Thrust block is of the Michel patent type with enclosed lubrication. Steam is supplied by five single ended cylindrical boilers working at 215 lbs pressure under Howden's latest system of forced draught. Linkleters' Patent Ship Fittings Company has supplied their self-levelling step accommodating ladders to the vessel, and Messrs. J. & H. Hall, of Dartford, have supplied the refrigerating plant installed.

Heavy Chemical Industry in Japan

THE heavy chemical industry of Japan is well established and covers a fairly wide range of manufactured products. Domestic supplies of raw products are, with few exceptions, limited, and the processing is expensive. The total production has increased, however, in 1920 and 1921 by 75 per cent over that of 1919. This increase has not been characteristic of nitric acid, wood-distillation products, and potash and aluminum salts, which products have declined 50 to 75 per cent. These, in the main, might be termed secondary processed materials, dependent upon supplies of foreign raw materials. Even sulphur, a domestic product, declined 30 per cent.

Acetic acid, calcium acetate, and wood spirits.—The total capacity of the Japanese acetic acid industry is 8,250 tons of acetic acid per annum, but the output in 1921 was less than one-third of this quantity, owing to trade depression and foreign competition. During 1922 Japanese output of acetic acid was increased to one-half the industry's capacity, and exports were increased, but this recovery of trade may be attributed to the fact that the output of European and American goods was insufficient to meet world demand. Japan's production of calcium acetate, from which acetic acid is produced, is adequate for but one-third of the acetic acid production capacity, and hence Japan is dependent upon imports of this commodity. A still more interesting fact is that acetate of lime can be imported from the United States and Canada more cheaply than it can be manufactured in Japan, thus accounting for the decline of 75 per cent in the 1921 production of calcium acetate below that of 1919. As in the years 1922 and 1923, practically the entire supply of this raw material came from American sources. In view of such dependency, reduction in acid output is inevitable, and a virtual loss of Japan's export trade in this commodity follows. The rubber plantations of the Straits Settlements, Dutch East Indies, and British India are practically Japan's sole export outlet, these customers in the past accounting for fully one-half of the total production. Production of wood spirits, derived from the same source and processing, namely, distillation of hardwood, was in 1921 but one-fourth of that of 1920. The consumption of this product is entirely domestic and dependent upon domestic prosperity, particularly in the textile industry. Japan has, however, been regularly importing more than 50 per cent of its domestic requirement from the United States.

Sulphuric, hydrochloric, and nitric acids.—Japan's natural sources of pyrites (iron sulphide) place the country in an independent position as to the manufacture of sulphuric acid. The low cost or selling price of the product, together with the great weight and shipping difficulties involved, relieves Japan of all fear of competition. Japanese production has consequently practically doubled, in line with the increased consuming demand for fertilizers and the manufacture of other acids which are the principal outlets. The same is true of hydrochloric acid. Available supplies of sulphuric acid and sodium chloride result in an independent hudrochloric acid industry the size of which is governed purely by Japan's domestic demand. Neither of these commodities is for export except where a short haul is involved. Nitric acid production, however, is dependent upon supplies of Chilean nitrate, and consequently Japan cannot hope to enjoy an independent industry any more than any other country of the world, unless the Japanese establish a nitrogen-fixation industry capable of producing nitrate to compete with the Chilean product.

Calcium carbide and synthetic nitrogen products.—Calcium carbide is manufactured in Japan by the electrochemical process in quantities sufficient to meet the local demand and to market in the other countries of the Orient to the extent of over 3,000,000 pounds. There has been an overproduction of this commodity, and in view of the shortage of ammonium sulphate of domestic production a number of these factories have converted their plants, or a part thereof, to produce cyanamide and ammonium sulphate as well. The total production of these commodities by this industry is recorded as 15,000,000 yen for 1921.

Acetone, potassium chloride, and chlorate.—The former is derived from the ashes of seaweed in conjunction with iodine derivatives. Enough has been produced to meet domestic requirements, and the same is true of the potash salts, of which the output of the electro-chemical industry was valued at 423,000 yen worth in 1921. This industry, protected by a duty of 15.13 yen (1 yen at normal exchange equals ($0.498) per hundred kin (1 kin eqals 1.3227 pounds) specific, in the case of acetone, and a 20 per cent ad valorem duty for the refined chloride, has made Japan independent of German supplies of these materials, and in addition Japan enjoys a sale in near-by markets of its surplus. There has been large demand for the chlorate in the enormous match industry of Japan, but this outlet is rapidly declining.

Ethyl alcohol.—Production for the year 1922 amounted to approximately 4,000,000 gallons, of which amount 2,000,000 was for home consumption, 1,250,000 for export, and 750,000 for converting into denatured alcohol.

Sulphur.—This industry, which came into prominence during the war, is steadily declining. Production has been decreasing year by year. The real picture may be better appreciated by a glance at the recorded exports of Japan. Outside of its own domestic market, Japanese sulphur is being steadily displaced on the other markets of the Far East by American sulphur, which can be sold for 40 per cent less, based on mine processing cost. This is merely a repetition of what occurred in Spain, and what was happening to the subsidized sulphur industry of Italy prior to its agreement with the American producers relative to the present allocation of world trade.

Soda ash, caustic soda, bleaching powder, etc.—Before the war the production of caustic soda was in the neighborhood of 9,000,000 pounds, but by 1919 it had increased to 23,759,000 pounds. In pre-war days two-thirds of the domestic demand was supplied from abroad. The country is importing a large quantity of caustic soda every year, owing to the high cost of home-produced goods, an inadequate source of supply of salt, and the comparatively low price of the foreign article. The total supply of caustic soda in 1919, for instance, reached 104,000,000 pounds, of which 80,000,000 pounds were imported. Deducting 1,000,000 pounds for exports, the amount available for domestic consumption was over 103,000,000 pounds, or 40,000,000 pounds more than was required in the record year, 1917. The result was a collapse of the market, driving several firms into bankruptcy. The manufacturers combined in June, 1920, and agreed to cut down output by as much as 60 per cent, to increase exports, and to check imports. Their efforts were rewarded by reduced stocks and improved prices by the end of 1921. It was purely at the expense of imports, however, which were reduced 95 per cent. The Japanese manufacturers, instead of actually curtailing in 1921, produced on the same basis as 1919, which was approximately 30 per cent greater than the production of 1920, the year in which the restriction was inaugurated. That the output increased so much, despite the restriction of 60 per cent, is explained by the conversion of soda ash into caustic soda, which had been briskly carried on, as there was no restriction on the manufacture of this product for export. However, the looked-for exports did not materialize in 1921—in fact, they were but one-third of that of 1920.

The production in 1922 was 38,028,493 pounds, double that of 1920, and a 60 per cent increase over the preceding year. Imports were but 3,000,000 pounds in 1921 and were increased to 46,000,000 pounds in 1922, while exports had practically disappeared. These facts clearly indicated poor enforcement, which condition was realized in November, 1922, and the Japanese alkali combine dissolved by mutual consent.

American caustic soda, which had been the major foreign supply in 1919 and 1920 but had been out of the market in 1921, re-entered the market quite aggressively in 1922, and British and Japanese producers, who had practically divided that market on a 40-60 basis, have been carrying on a price-cutting business ever since, even as late as 1923, which practically demoralized the market without succeeding in routing the American product. The story of caustic soda is virtually a duplication of the soda-ash market, the consuming demand for which is estimated at 80,000 tons annually. The same may be said of bleaching powder, the production of which amounted to 51,497,296 pounds in 1922. However, this represented a normal production, comparable with previous years, supported by a steady annual consuming domestic demand of approximately 40,000,000 pounds, as well as an export demand of 6,000,000 pounds, and no imports to disturb the market.

It is interesting to note in passing that two-thirds of the value of Japan's bleaching and caustic soda production is manufactured by the electrochemical industry.

JAPANESE EXPORTS OF HEAVY CHEMICALS

Chemicals	Total	United States	China and Kwangtung	Hongkong	British India	Dutch East Indies	Straits Settlements
Sulphur:	*Piculs*	*Piculs*	*Piculs*	*Piculs*	*Piculs*	*Piculs*	*Piculs*
1922 ...	64,079	—	—	—	—	—	—
1921 ...	97,539	—	34,799	25,649	7,265	23,782	—
1920 ...	328,111	—	32,931	19,175	172,968	70,634	—
1919 ...	477,806	1,877	45,231	13,012	97,320	50,063	—
Acetic acid:							
1922 ...	12,641	—	—	—	—	—	—
1921 ...	2,808	—	1,623	32	243	—	578
1920 ...	22,403	356	710	63	2,951	4,956	12,896
1919 ...	36,827	79	426	122	2,270	2,424	29,771
Sulphuric acid:							
1922 ...	54,223	—	—	—	—	—	—
1921 ...	35,004	—	14,815	10,897	1,214	2,181	3,122
1920 ...	73,449	—	15,886	16,696	661	15,376	17,694
1919 ...	53,541	—	19,406	6,343	790	13,695	9,468
Copper sulphate:							
1922 ...	906	—	—	—	—	—	—
1921 ...	727	—	507	82	—	—	75
1920 ...	1,372	—	382	—	565	362	46
1919 ...	12,401	—	3,790	360	5,244	762	103
Nitric acid:							
1922 ...	22,251	—	—	—	—	—	—
1921 ...	17,760	—	15,627	1,570	—	182	247
1920 ...	—	—	—	—	—	—	—
1919 ...	—	—	—	—	—	—	—
Caustic soda:							
1922 ...	2,433	—	—	—	—	—	—
1921 ...	13,553	2,327	7,816	3,180	—	—	—
1920 ...	63,816	3,245	17,487	4,116	1,423	9,016	850
1919 ...	8,300	—	4,017	244	—	167	—
Sodium sulphide:							
1922 ...	81,096	—	—	—	—	—	—
1921 ...	65,455	—	48,673	11,808	4,476	—	300
1920 ...	—	—	—	—	—	—	—
1919 ...	—	—	—	—	—	—	—
Potassium chlorate:							
1922 ...	21,491	—	—	—	—	—	—
1921 ...	17,697	—	13,987	3,368	144	—	—
1920 ...	19,351	—	14,345	4,514	263	—	—
1919 ...	27,916	1,343	19,510	2,713	423	38	20
Bleaching powder:							
1922 ...	46,242	—	—	—	—	—	—
1921 ...	47,837	—	33,296	14,249	—	—	—
1920 ...	44,494	—	28,936	8,805	6,333	—	—
1919 ...	40,534	—	27,479	7,067	2,905	634	284
Calcium carbide:							
1922 ...	25,352	—	—	—	—	—	—
1921 ...	22,551	—	14,747	3,834	658	151	1,750
1920 ...	17,429	—	14,426	84	89	—	7,116
1919 ...	25,499	—	12,875	1,771	480	3,180	584

Sulphur.—This is still Japan's principal export as to quantity, but it also is the cheapest. China is apparently the chief export market. Owing to inability of American producers to cater to the volume of demand for acetic acid, Japan has been more successful in 1923. Although still maintaining its market in China for sulphuric acid, Japan is steadily losing in all others with the exception of British India, and as far as Japanese copper sulphate is concerned, it has practically become an unknown export product, even to China. In nitric acid there is no competition as every nation is dependent on a common source of nitrate and enjoys near-by nonproducing markets. Supply and demand is the answer to Japan's exports of bleaching powder, sodium sulphide, and chlorate of potash. Activity in the textile trade, the application of coal-tar colors, and the match and pyrotechnic trades, respectively, have increasingly absorbed these products, although current foreign competition in the case of the three former and a slump in the latter is tending to destroy Japan's trade in these commodities as well. Calcium carbide has been Japan's only other constant product. Finally, the loss experienced in Japan's caustic soda trade is such as to eliminate that country from consideration as a factor in other far eastern markets.

Exports

Imports of these materials into Japan were practically equal in value in 1919 and 1920, and the United States enjoyed 60 per cent of the trade. In 1921, however, Japan's imports were but 36 per cent of either 1919 or 1920, and the participation of the United States was cut to one-half its previous quota, or 30 per cent, which amounted to but one-fifth of the previous years. In 1922 Japan's imports were about three-fourths of that of the peak years, and, as previously stated, the quota of the United States, which is not definitely known at present, in merely indicated in a few cases as recorded in the United States Commerce and Navigation for 1922.

Oxalic acid.—Japanese imports have remained fairly constant since 1919, although the more recent proportion of oxalic acid supplied by the United States has dropped considerably. Great Britain has been a constant and practically the only competitor of the United States up to 1921. In that year Germany entered the market for the first time of record since the war, supplying 33 per cent of the total, which was a greater percentage than that of either Great Britain or the United States. The oxalic acid industry is another example of a war-time development in the United States, and the facilities for production are now well established. With the present tendency in Japan to develop chemical processes, there should be an increasing market for this acid in their dye production, in bleaching processes, in the manufacture of certain metal polishes, and in the textile industry. The textile industry is an important factor in Japanese domestic life, and the consumption of oxalic acid by that industry should be a point of attack by American representatives.

Caustic soda.—Japanese imports of this product have been quite heavy. Although importation dropped from 600,898 piculs in 1919 to 21,744 piculs in 1921, it rose to 348,781 piculs in 1922, following the liquidation of post-war and speculative accumulations. The United States has held by far the largest portion of this market through 1921. The only other competitor of any consequence was Great Britain, which, through organized effort, controlled the market in 1922. Hence, the question of increased sale for the United States alkalies seems to be dependent upon increased consumption in Japan and more forcible competition against the British sales policy. With the development of Japanese industry in general, there should be further sales of American caustic soda, but the service factor and organized effort on the part of American producers must be more highly developed.

Soda ash and natural soda.—Japanese imports were very heavy from 1919 through 1922, ranging from approximately 1,000,000 to 1,500,000 piculs. Great Britain has always been the principal supplier of soda and soda ash, with the United States as practically the only competitor. In fact, one British concern practically controls the Japanese import market so strongly as seriously to threaten to destroy even the domestic production.

Bicarbonate of soda.—Japanese imports of this commodity have not been as large as those of soda ash. Great British has led in this trade, obtaining approximately 80 per cent of the total. The market is practically divided between Great Britain and the United States.

Borate of soda.—The United States supplied during 1919 and 1920 nearly all of the borate of soda imported into Japan and continues to maintain this position. Borax is being imported into Japan in large quantities, principally for use as a glaze in the enamel-ware industry. Although small quantities are used in other industries, the trade in borax has been developed parallel with the development of the enamel industry.

Bichromate of soda.—All the imports of this commodity were supplied by the United States in 1921. Statistics do not show any imports of this chemical prior to that year.

Cyanide of soda and potash.—These commodities were practically entirely supplied by Great Britain. Current trade papers show that not infrequently American manufacturers of such products as sodium cyanide arranged for the exportation of their available output to an established British house, which no doubt re-exported the American product to the various world markets. Also the fact has come to the attention of this department that in far eastern bidding foreign competitors of American dealers have successfully obtained contracts and then purchased of American manufacturers the identical materials on which they were successful bidders. This situation, wherein there is a market for American chemicals with at least two profits added, serves to show that there should be a better market for the direct export of those chemicals with but one profit added. American exporters, however, must have the suitable representation, personal contact, a thorough knowledge and organization in the world's markets that our foreign competitors enjoy. In brief, we may well expect to receive competition in the Japanese soda market from firms controlled by Great Britain, inasmuch as one company represents the entire strong British interests and maintains a supply of soda chemicals for ready delivery. The effectiveness of the British representation is readily seen in the import figures on soda ash, bicarbonate, and borate of soda. It is reasonable to suppose that with proper organization and representation United States producers would be able to increase greatly sales in these commodities. Another important point in connection with these heavy chemicals other than the effectiveness of British representation in that market is the Japanese sale rights in Magadi soda. One Japanese company has the entire rights in that market for the Lake Magadi soda of Kenya Colony, Africa.

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* Complete detailed figures by countries for 1922 are not available; blanks therefore, following the total for that year do not necessarily mean that no trade was carried on with those countries.

Note.—There were no exports of heavy chemicals to France during these years; none to Great Britain except 34 piculs of potassium chlorate in 1920, and 118 piculs of the same product in 1919; and none to Germany but 2,369 piculs of caustic soda in 1920.

Bichromate of potash.—It is interesting to note that the United States seems to have held very successfully a large share of the Japanese trade in bichromate of potash. In 1921 the principal competitor of the United States was Germany, and those two countries shared the Japanese market equally. Germany enjoys natural advantages so far as potash is concerned, and it is therefore assumed that such success as the United States has enjoyed has been due to a more perfect and less costly processing of the raw products.

Chloride of ammonium.—The market for this commodity is almost entirely held by Great Britain. Why this should be so is not readily apparent, unless it is due to more effective British sales methods. The manufacturing conditions in Great Britain are certainly no more favorable than they are in the United States. The same is true of carbonate of ammonium, of which Great Britain exported the principal amounts to Japan.

Calcium acetate, formalin, and methyl alcohol.—Calcium acetate is entirely supplied by the United States. No opportunity should be allowed to pass to introduce it for any new purpose where it may be employed. A similar statement might be made in the case of formalin and methyl alcohol, both of which are produced in enormous quantities in the United States. The fact that we now supply practically all that Japan imports should be used as a basis for strengthening good will and creating a further demand. These products may also be used as important leads in the more intensive development of the heavy chemical market of Japan.

Glycerine.—Japan has been a steady importer of glycerine, and, although in 1920 the trade fluctuated greatly in favor of Great Britain, in 1921 the United States improved its relative position over that of Great Britain, but apparently lost this advantage in 1922. American producers of glycerine should be aware of the active demand for this product in Japan. There is a good market in Japan for pharmaceutical and toilet preparations, and the well-known fact that Japan is endeavoring to expand its own industry along these lines should spur American glycerine manufacturers, since this product finds extensive use in the manufacture of such commodities in addition to its use in the making of dynamite, as a solvent, in the laboratory, and in certain industrial processes.

Reconstruction Number of The Far Eastern Review

PRESS REVIEWS

North-China Daily News:

An Echo of the Earthquake

The Reconstruction Number of the "Far Eastern Review," which has just come off the press, is one of the most remarkable publications ever issued in the Far East. Consisting of more than 400 large quarto pages, the magazine gives a fully illustrated and graphic account of the efforts of the Japanese Government and Japanese engineers to reconstruct Tokyo and Yokohama. Excellent reproductions of photographs depict the enormous damage done by the earthquake over a wide area and also the feats of reconstruction the Japanese have accomplished since. Although primarily of interest to engineers many others will feel that $5.00, at which price this special issue is sold, will be well invested in acquiring a copy. It is printed by *The North China Daily News* and is on sale at all booksellers.

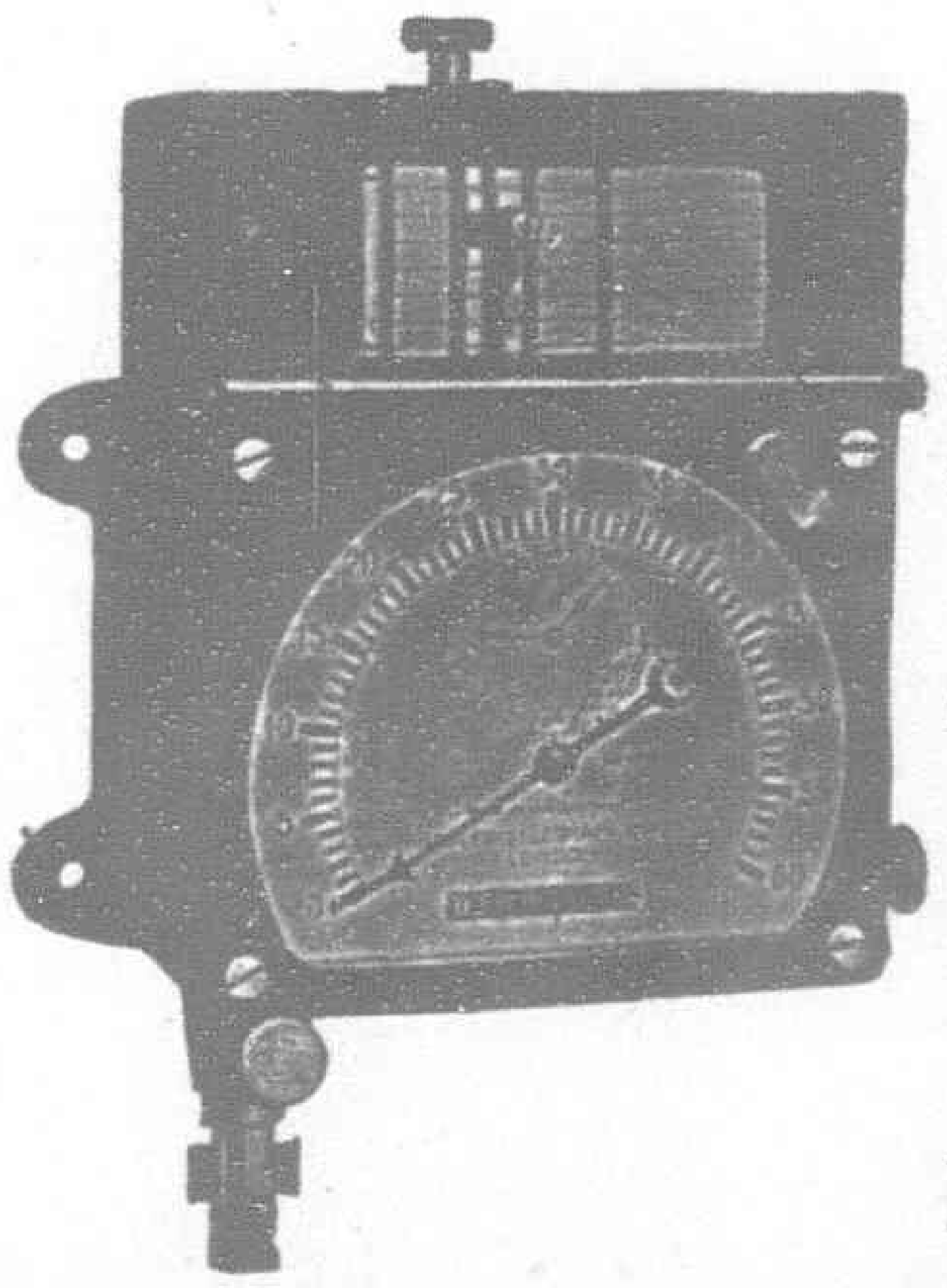
Shipping and Engineering:

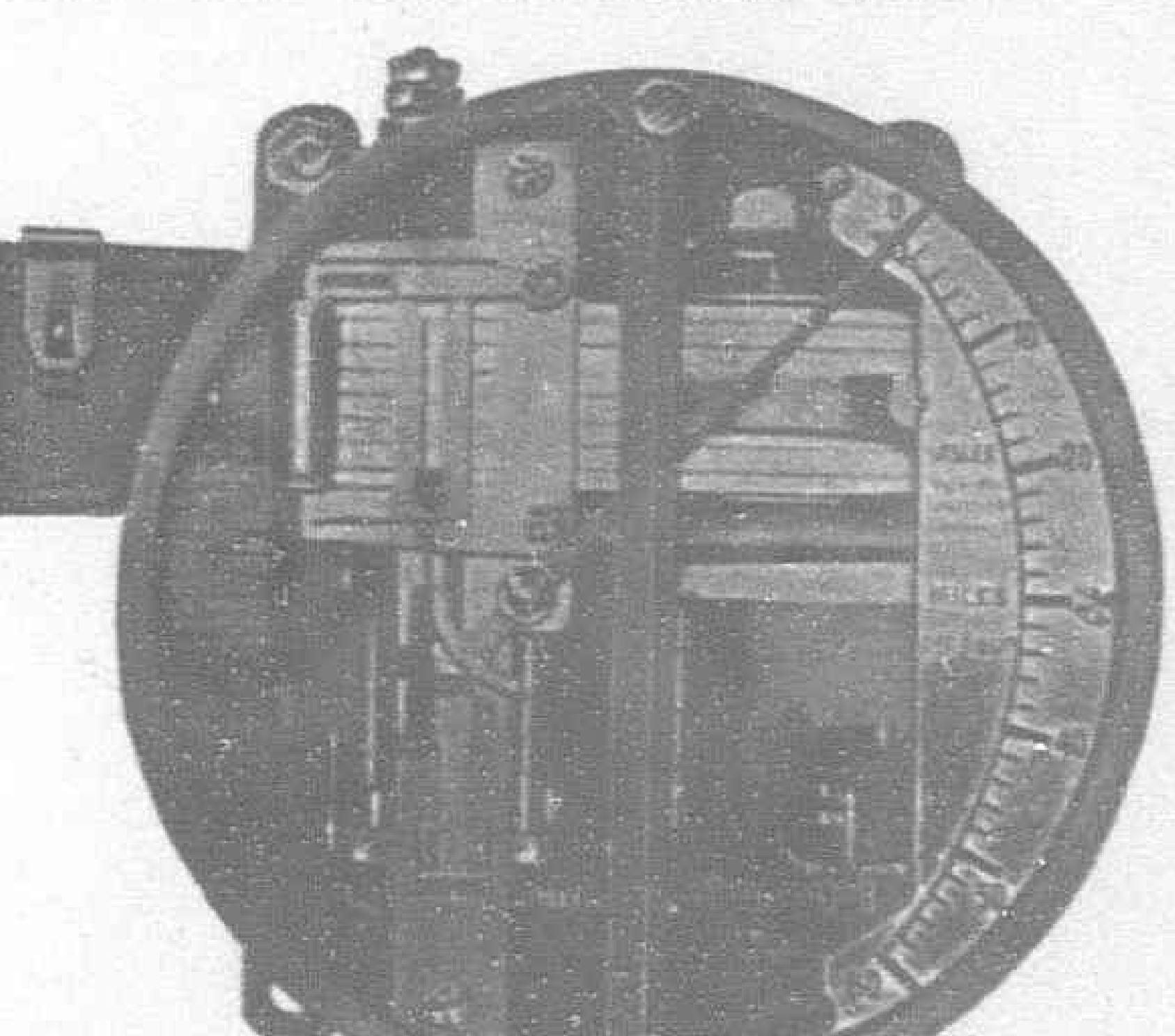
Mr. George Bronson Rea, Editor and Publisher of the *Far Eastern Review*, Shanghai, is heartily to be complimented on the Japanese Reconstruction Number of the Journal, which has just made its appearance, and which is probably the most valuable, interesting and praiseworthy issue of any periodical that has yet been printed in the Far East. Dedicated to the Japanese engineer, "whose monument will ever be the recreation of Tokyo and Yokohama after the terrible earthquake and fires had reduced those cities to veritable dust," this noteworthy issue of a monthly magazine which already stood in a class alone and apart, constitutes a printed and pictorial record of one of the mightiest industrial and engineering efforts in history—the reconstruction of Japan's capital and her largest port after one of the worst calamities in the records of mankind; and one cannot pay the *Far Eastern Review* a greater compliment than by saying that the Reconstruction Number is a worthy record and appreciation of the mighty effort its pages depict so well.

Hongkong Telegraph:

Japan's Reconstruction

It is now just two years since the greatest calamity that Japan had ever known in her history affected a large area of her most populous territory—destroying one of her large seaports and wrecking a great deal of her capital. There was terrible loss of life, and scenes of horror such as only a vast catastrophe can give rise to. The terrible effects of the great earthquake are still evident at both Yokohama and Tokyo, but a great amount of reconstruction work has been accomplished. In the comparatively short space of two years the Japanese engineers and their assistants have rebuilt much that had been destroyed, and it should not be long before practically all the broken achievements of the past are replaced. We are reminded of this achievement by the recent publication of a journal devoted to a description, graphically illustrated, of the feat that the reconstruction department has performed—and it is undoubtedly an accomplishment of which the Japanese nation can be justly proud.





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Gambir or Catechu Production in the Dutch East Indies

(*Continued from page 38.*)

to 60 per cent, cannot be called a necessary evil, but is simply a case of adulteration. Borneo gambir is sometimes also adulterated with yellow clay, a practice which has been very detrimental to the reputation of the product. This adulteration, however, is not so much of a fraud as a wrongly chosen device to keep going an industry which is unremunerative when prices are low.

The production of gambir in the Dutch East Indies is very large, much larger than would appear from the export statistics, the local trade being very important. Singapore is chiefly a port of transhipment, and the large quantities which it receives from Sumatra and the Rhio-Lingga Archipelago are distributed from there over the whole world.

The following table shows the direct exports of yellow catechu for the last ten years. The figures will obviously be an indication of the importance of the industry and the demands in the civilized world for the commodity.

		Whereof to.—		
	Total Exports Kilos	Europe	U. S. A.	Straits Settlements (chiefly for transhipment
1915	6,895,000	1,728,000	109,000	5,118,000
1916	7,199,000	2,093,000	179,000	4,913,000
1917	6,269,000	785,000	1,100,000	3,736,000
1918	5,918,000	—	191,000	5,672,000
1919	8,035,000	1,730,000	473,000	5,103,000
1920	4,943,000	1,012,000	264,000	3,645,000
1921	5,902,000	2,860,000	823,000	2,178,000
1922	6,531,000	3,285,000	1,946,s00	1,267,000
1923	5,103,000	2,106,000	960,000	2,010,000
1924	6,596,000	1,840,000	1,435,000	3,304,000

The exported product is used mainly in hide tanneries. It is highly appreciated as a tanning agent since it is obtainable in abundance during the entire year and may be used for the preliminary tanning process, the tanning proper, and the final tanning. It is especially suitable for preparing harness and upper leather, and in general for such kinds of leather as must be finally treated with fat.

The material is very useful in the final tanning, because it produces a clear and equal color which appears very gradually, so that shading can be controlled. The high price of really pure catechu is, however, still an obstacle to its general use in hide tanneries and limits its application to the better kinds of leather. By modernizing the process of preparation, the cost price may be reduced considerably, and its general application made possible.

Besides being used in tanning, the material is put to many other uses. It enters largely into the silk industry, e.g. at Lyons, France, as a dyeing agent, and that in spite of the competition with aniline dyes. The color it produces appears to be richer and warmer. Furthermore, the article is used in breweries as a substitute for hops, both for its clarifying properties, to precipitate albumens, and to give the beer its well-known bitter flavor.

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